

MASTER THESIS

Dutch agricultural trade flows to the UK and corresponding logistics hotspots in the South-Holland region after Brexit



Jaco van de Wijdeven
581766
Bart Kuipers
Martijn Streng
11-08-2022

"The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam."

Abstract

In 2020, the UK left the EU formally and since January 1st 2021, the EU and the UK started a new post-Brexit partnership. Studies by OECD and other research groups discussed expected the greatest effects on UK side. On EU side, these studies expected the greatest impact for the Dutch agriculture.

Now, one and a half year post-Brexit, I conducted a research on the Brexit effect on Dutch agricultural trade flows to the UK and logistics hotspots in the South-Holland region so far. I combined a quantitative difference-in-differences tool, in which I compare the Dutch agricultural exports to the UK with the Dutch agricultural exports to the counterfactual EU countries Germany, Belgium, France, Italy, Spain, Poland, Sweden and Denmark, with qualitative interviews to obtain my results.

Quantitatively we see that the first phase of regulations did not affect domestically produced exports to the UK, but the extra import tariffs for extra-EU originated goods resulted in a significant reduction of Dutch agricultural re-export and quasi-transit flows to the UK. Furthermore we see that Greenport West-Holland's specialized product groups floriculture and vegetables are not affected, but the product group fruit is negatively affected. The Brexit effect on the agricultural throughput in the port of Rotterdam is for now still somewhat ambiguous, but this might turn into a negative effect in the coming decade when UK ports become better facilitated and well-organized.

Qualitatively we see that the industry experienced quite some transition bottlenecks and a permanent loss in flexibility due to the regulations. Furthermore, the Brexit obliged actors in the supply chain to collaborate, which is important to continue with because of all the challenges that the industry will face in the years to come.

Keywords: Brexit, Agriculture, Export, Transit, Extra-EU

Acknowledgements

I would like to express my appreciation to my supervisor, Bart Kuipers, for his guidance and feedback during this process, and to the second assessor, Martijn Streng, for his reviewing. I also want to give a special thanks to Pascal Ramaekers, Statistical Researcher at CBS, who helped me during my data collection.

I am also grateful to all the interviewees and the people who replied on my emails, who took the time to help me with my research. Thanks should also go to Frank van Oort and Carlos Riumallo Herl, (assistant) professors at the Erasmus School of Economics, and to my fellow students who were willing to spar with me about my research method and other topics.

Lastly, I would like to thank my parents for the unconditional trust and other close family members and friends for the support throughout this process.

Table of contents

Abstract	2
Acknowledgements	3
Figures and tables.....	6
Figures	6
Tables	7
Introduction.....	8
Brexit	9
Trade flows	10
Dutch agricultural exports.....	11
Agriculture South-Holland	12
Literature review	13
Pre-Brexit years	13
Post Brexit	16
Hypotheses.....	18
Data and research methodology	20
Data collection.....	20
Research methodology.....	23
Difference-in-differences	23
Interviews	27
Results	29
Dutch agricultural total trade flows to the UK	29
Dutch agricultural domestically produced exports to the UK.....	33
Dutch agricultural re-exports to the UK.....	35
Dutch agricultural quasi-transit to the UK	38
Greenport West-Holland clusters.....	40
Floriculture	41
Vegetables.....	43
Fruit	46
Throughput port of Rotterdam	48
Competitive edge	51
Qualitative results	52
Bottlenecks.....	52
Flexibility.....	53

Persisting problems	53
Specialization.....	54
Supply chain collaboration	54
Discussion	55
Conclusion	58
References.....	60
Appendix I List of Primary and Secondary agricultural product groups.....	65
Appendix II Dutch agricultural export values to all countries	66
Appendix III Excel output lay-out Eurostat Easy Comext	67
Appendix IV STATA Regression output example	68
Appendix V Stata Total trade flow	69
Appendix VI Stata Re-export Dutch exports and Quasi-Transit	71
Appendix VII Stata Greenport WestHolland.....	73
Appendix VIII Gains and losses in exports to UK in million euro's	75

Figures and tables

Figures

1. Figure 1 Agricultural and Industrial tariffs	19
2. Figure 2 Input boxes Eurostat database	21
3. Figure 3 Difference-in-differences example	24
4. Figure 4 Difference-in-differences estimators	25
5. Figure 5 Trend total agricultural flow	30
6. Figure 6 Trend total non-agricultural flow	30
7. Figure 7 Annual growth total flow 11-16 16-21	31
8. Figure 8 Annual growth total flow 11-16 16-20	31
9. Figure 9 Annual growth total flow 11-20 20-21	32
10. Figure 10 Visual D-I-D Regression effects total flow	32
11. Figure 11 Trend domestic agricultural exports to UK	33
12. Figure 12 Trend domestic non-agricultural exports to UK	33
13. Figure 13 Annual growth domestic exports 19-20 20-21	34
14. Figure 14 Visual D-I-D Regression effects domestic exports	34
15. Figure 15 Trend agricultural re-exports to UK	36
16. Figure 16 Trend non-agricultural re-exports to UK	36
17. Figure 17 Annual growth re-exports 19-20 20-21	36
18. Figure 18 Visual D-I-D Regression effects re-exports	36
19. Figure 19 UK EU and extra-EU imports of vegetables and fruit 2017-2021	37
20. Figure 20 Trend agricultural quasi-transit to UK	39
21. Figure 21 Trend non-agricultural quasi-transit to UK	39
22. Figure 22 Annual growth quasi-transit 19-20 20-21	39
23. Figure 23 Visual D-I-D Regression effects quasi-transit	39
24. Figure 24 Trend floriculture exports to UK	41
25. Figure 25 Trend total agricultural exports to UK	41
26. Figure 26 Annual growth floriculture 11-20 20-21	42
27. Figure 27 Visual D-I-D Regression effects floriculture	42
28. Figure 28 Trend vegetables exports to UK	43
29. Figure 29 Trend total agricultural exports to UK	43
30. Figure 30 Annual growth vegetables 11-20 20-21	44
31. Figure 31 Visual D-I-D Regression effects vegetables	44
32. Figure 32 Self-sufficiency UK vegetables	45

33. Figure 33 Trend fruit exports to UK	46
34. Figure 34 Trend total agricultural exports to UK	46
35. Figure 35 Development 2017-2020: Mean of daily consumption of fruit and vegetables	46
36. Figure 36 Annual growth fruit 11-20 20-21	47
37. Figure 37 Visual D-I-D Regression effects fruit	47
38. Figure 38 Self-sufficiency UK fruit	48
39. Figure 39 UK EU and extra-EU imports 2017-2021	49
40. Figure 40 Global deep-sea, feeder and short-sea connections port of Rotterdam	49
41. Figure 41 Port of Rotterdam deep-sea to feeder transshipment volumes 2021	50
42. Figure 42 Global agricultural trade 95-20	50
43. Figure 43 Global trade 95-20	50

Tables

1. Table 1 Expected qualitative results per trade agreement outcome	13
2. Table 2 Dutch export/Re-export shares CN06/07/08	19
3. Table 3 Interviewee information	28
4. Table 4 Shares Dutch, re-exports and quasi transit	30
5. Table 5 STATA regression output total trade flow	31
6. Table 6 STATA regression output domestically produced exports	34
7. Table 7 STATA regression output re-exports	37
8. Table 8 STATA regression output quasi-transit	39
9. Table 9 STATA regression output floriculture exports	42
10. Table 10 STATA regression output vegetables exports	44
11. Table 11 STATA regression output fruit exports	47

Introduction

In 2016 the UK voted during the Brexit referendum with a majority for the disengagement of the UK out of the European Union, which resulted in the Brexit. After years of negotiating, both parties agreed on a new partnership, which started on January 1st 2021. Previous studies by the OECD and other groups of researchers discussed the (potential) negative effects of the Brexit on the EU and Dutch economy and its competitive position. These expected effects were heavily dependent on the outcome of the final trade agreement, which was agreed only a week before the Brexit was actually happening on December 24 2020. In general, the Brexit was expected to have the highest impact on UK markets, with also an increasing inequality. Furthermore, in the rest of the EU countries, the Netherlands was expected to be one of the most heavily impacted countries. Even more specific, with the highest regional impacts in the Dutch provinces South-Holland and Zeeland and the highest sectorial impacts in the agriculture industry.

All those studies, which are discussed in the chapter *literature review*, were done with expectations about what was going to happen. Now, one and a half year after the completion of Brexit, we can estimate the impact Brexit had so far. Keeping previous studies in mind, I want to elaborate more on the effect of Brexit on the Dutch agricultural trade flows and its logistics activities in the province South-Holland, NL33 according to the official NUTS 2021 classification (eurostat, 2021). This region has many agricultural logistics hotspots such as in the port of Rotterdam, but also at the nearby Greenport clusters in Barendrecht/Ridderkerk and Westland (Redacteur, 2019).

In this thesis I discuss the Brexit effect by answering the following research question:

What is the effect of the Brexit on Dutch agricultural trade flows to the UK and its corresponding logistics activities in the port of Rotterdam and the larger port environment?

This question is answered by using a mixed research method of quantitative and qualitative methods. For the quantitative part I use the econometric Difference-in-Differences tool and for the qualitative part interviews are performed with industry experts. This research method is explained more extensive in the *Data and Research Methodology* chapter of this thesis.

In this introduction I introduce briefly the topics of my thesis with the descriptions of the Brexit and its new regulations and formalities, the different trade flows, the Dutch agriculture and its logistics hotspots in South-Holland. This is followed-up by a literature review of existing studies regarding (expected) pre- and post-Brexit impacts, developments and measures. This literature review is also the basis for my hypotheses, which are discussed at the end of the chapter. Thereafter I discuss my data collection and describe my research methodology before I turn to the results of this thesis. Finally, I

discuss the contribution of my thesis to previous literature, the strengths and limitations of my research and my recommendations for future research, before I end with the final conclusion.

Brexit

In June 2016, the UK voted to leave the EU in a Brexit referendum. Nine months later, March 2017, the UK formally report its intention to leave the EU. In June 2017, a year after the referendum, the negotiations on the UK's withdrawal started. After years of negotiation, the withdrawal agreement was approved and completed on January 30 2020. Two days later, the UK left the EU formally, which was also the start of a transition period with negotiations about a future EU-UK partnership agreement. On December 24 2020, only eight days before the end of the transition period, the EU and UK agreed the Trade and Cooperation Agreement (TCA) (European Commission, 2021).

In this Trade and Cooperation Agreement, new regulations were agreed, which were planned to be enrolled in multiple phases, starting on January 1st 2021 with the first phase. I elaborate on the most important regulations regarding the agricultural exports from the EU to the UK, based on the official document of the UK government (HM Government, 2022). The first phase of border regulations contained the following:

- It was agreed that EU-UK trade is tariff and quota free, provided that these goods meet the rules of origin requirements to be determined as originating from the EU or UK and that this latter can be proved. This can be proved for goods that are entirely created, or substantially transformed in the EU. Goods do not obtain EU origin only by being previously cleared by customs procedures.
- In this first phase, full border controls were implemented on imports coming into the UK from the EU, however in the first year traders who imported non-controlled goods, could choose to delay their custom declaration and tariff payments for 175 days. Controlled goods already needed full-declarations at the day of import and physical checks were included.
- EU exporters needed to request their own EU-EORI number, if they did not have one already, in order to fulfil any customs processes. But in case of DDP incoterms, which is very common in agricultural exports to the UK, EU traders also needed to apply for a GB-EORI number.
- Veterinary and phytosanitary health certificates were now required for live animals and high risk plants respectively.
- Hauliers were only permitted to get access to the UK with a valid passport.
- Pre-notification of exports were needed in Portbase, the Dutch Port community system, in order for the haulier to get access to the terminals at the Dutch ports. No pre-notification means no access to the terminal, which will cause cargo to come to a standstill before crossing the border.

On January 1st 2022, the UK implemented the second phase with the following additional or tightened regulations:

- Full customs declaration and tariff payments had to be fulfilled at point of importation.
- Veterinary and phytosanitary goods were now subject to a required pre-notification with some specific product details.

The UK government was planning to implement the third phase of regulations on July 1st 2022. In order to spare businesses and people from an extra disruption after being hit by the war in Ukraine and growing inflation, the government decided to postpone the third phase of regulations. At the end of 2023 the UK government will publish a Target Operating Model for their border control regime, which will include at least the following regulations:

- Mandatory health certificates for all veterinary and phytosanitary goods.
- Live checks on all veterinary and phytosanitary goods at specific locations with a Border Control Post.

Trade flows

While estimating the effect of the Brexit I make a distinction between different trade flows, which are impacted differently by the various new regulations and formalities. There are several trade flow concepts which can be distinguished in trade statistics (Roos, 2006). While explaining the concepts, I use the Netherlands as domestic country for trade flows to the UK.

Domestically produced exports, as it already self-explains, are products which are produced domestically, and exported to a foreign country like the UK. Customs clearance and formalities are required but no import tariffs have to be paid.

A second export concept is **re-exports**, goods which are imported and leave the country after no further processing, or at least without changing the product characteristics. The goods in question also have to be owned by a Dutch company at some point in the supply chain. Customs clearance and formalities are required and double import tariffs have to be paid for extra-EU goods.

If there is no change in ownership for the goods that are imported and re-exported, these goods are classified as goods in **transit**, or **true transit** trade. Customs clearance is not required, some custom formalities are required, but no double import tariffs have to be paid for extra-EU goods.

For some goods in transit, firms in the importing country perform some administrative actions before the goods leave the country again. This variant is called **quasi transit** trade. The goods in question are not owned by a Dutch company during the transport. Customs clearance- and formalities are required and double import tariffs have to be paid for extra-EU goods.

If goods in transit are imported from a foreign country and exported to another country without the goods coming physically to the domestic country, it is called **transito transit**. No double import tariffs have to be paid for extra-EU goods.

If extra-EU goods enter an EU country and are stored in a customs warehouse in expectation of a final buyer, it is called **entrepot transit**. If the buyer is outside the country, than goods are not deemed to have been in that country and no double import tariffs have to be paid.

The distinction in these concepts is increasing in importance due to expanding globalisation and world trade networks, especially for the Netherlands because of the relatively large share of re-exports in total exports and the huge amount of transit flows through Dutch territory.

Another important aspect in world trade networks and global supply chains is **transshipment**. Transshipment is the transport of goods through a territory where the goods are unloaded from one mode of transport and loaded on to another mode of transport (Dunne, 2016). For example, A container or bulk product is unloaded from a vessel at a terminal in the port of Rotterdam and loaded on a truck, train or barge, or another vessel, to another destination. In my research I consider the transshipment of containers at the port of Rotterdam from deep-sea vessels to feeder services in particular.

Dutch agricultural exports

The share of re-exports in the total exports is higher for non-agricultural goods, 52.5% in 2021, compared to agricultural goods, only 27.7% in 2021. Because of the large share of domestically produced goods in total exports, together with the fact that the Netherlands is the second largest agriculture exporter in the world (Investopedia, 2022), we can conclude that the Netherlands is specialized in the production of agricultural goods. This and other characteristics and developments are discussed in the annual publication of the Wageningen University and CBS (Jukema, Ramaekers, & Berkhout, 2022), which is an important starting point for this thesis. The authors of this publication make use of the same defined product groups as the European Commission, which are the first 24 primary and 42 secondary groups of the Combined Nomenclature code (CN code). This code helps to classify goods in the world of trade statistics (European Commission, 2022). Appendix I shows the names of the primary product groups, sorted by export value in 2021, and the list of secondary product group codes. In 2021, the total Dutch agricultural export value was 104.7 billion euros. 53% of this total export goes to surrounding European countries like Germany (25%), Belgium (12%), France and the UK (both 8%). The 2021 export values to all the countries can be found in appendix II.

If we look at the agricultural export results, the part that is left from the export value after deducting related costs for importing raw materials, intermediates, services and re-exports, we see that the Netherlands earns 11 cents per euro export value on re-exports and 60 cents per euro export value on domestically produced goods.

The agriculture in the Netherlands has also experienced the impacts from disruptions like COVID, Brexit, but also the container crisis with regards to reefer containers. The effect of COVID was less than for non-agricultural goods, which explains a smaller conjuncture- and crisis sensitivity, for a pandemic at least. But how is the industry affected by the Brexit and corresponding regulations?

Agriculture South-Holland

The province of South-Holland is an important area for the Dutch agricultural trade with logistics hotspots as the port of Rotterdam and the clusters of Greenport West-Holland. As the largest agriculture port and leading hub of Europe, the port of Rotterdam offers a wide variety of opportunities for the import, export and transit of agricultural goods, containerized or bulk.

On average 13-15% of the total container throughput in Rotterdam is accounted by agricultural goods (Greenport West-Holland, 2022). Imported product groups are mainly fruits and vegetables, exported product groups are mainly meat, fish and dairy. As origins and destinations, South-Africa, Brazil and Costa Rica are among the top import countries, and China, Senegal and USA are among the top export countries (Port of Rotterdam, 2021). If we look at the agricultural goods in bulk, we see that the port of Rotterdam offers several services for the storage and transshipment of goods such as corn, cereals, soybeans, cattle feed and oil seeds and oleaginous fruit. The port is well connected for imports from origin regions such as the Black Sea region or North- and South-America. If we look at the transshipment possibilities, the port is well connected for exports to destination regions such as Germany, the UK, Eastern-Europe and the Middle-East (Port of Rotterdam, 2022).

In the larger environment of the port of Rotterdam we can find two important clusters of Greenport West-Holland, namely Barendrecht/Ridderkerk and Westland. Greenport West-Holland is one of the seven greenports of Greenports Netherlands. It is a partnership, or triple helix as they call it themselves, between firms, knowledge institutes and governments in the region that form a cluster. The clusters Barendrecht/Ridderkerk and Westland offer a wide variety of production sites and smart and efficient logistics activities. All the stakeholders work together to maintain continuous improvement, not only in economics and logistics but also in knowledge, innovation, health and social development (Greenport West-Holland, 2019). The cluster is specialized in horticulture product groups, which are floriculture, vegetables and fruit (Berg, 2022).

Literature review

In the introduction of this thesis I already introduced some general results of previous researches which determined my research focus. In this chapter I elaborate more on the existing literature which is the basis of my thesis. I start with literature regarding the expected effect of the Brexit, while there was no deal agreed yet. Second, I elaborate more on other researches regarding the post-Brexit effects and possible developments in the coming years. I conclude this chapter with my research hypotheses.

Pre-Brexit years

The pre-Brexit years did not only provide predictions of the Brexit effect, but they had their own pre-Brexit effects on export investments and trade flows between the EU and the UK. Researchers concluded that increases in the probability of Brexit and trade agreement uncertainties reduced EU-UK exports and net export entry. These effects vary per country and industry. The impact on EU exports was twice as high than the impact on UK exports, and higher for industries with higher sunk costs (Graziano, Handley, & Limão, 2018).

In 2016, the period before the referendum, Berkum and Terluin, on behalf of Wageningen University, conducted an exploratory qualitative research on the possible consequences of the Brexit (Berkum & Terluin, 2016). They came up with five scenarios of possible post-Brexit trade agreements and estimated their impacts on the Dutch agriculture in terms of free trade and free movement of Capital. Below an overview of their qualitative results.

Trade agreement	Free trade agriculture	Free capital movements
Most Favoured Nation (MFN)	No	No
Membership EER (like Norway)	No	Yes
Bilateral agreements (like Swiss)	Yes	Yes
Customs union (like Turkey)	No	No
Free trade area	Possible	Possible

Table 1 Expected qualitative results per trade agreement outcome (Berkum & Terluin, 2016)

The difference in trade costs can differ substantially between the type of trade agreements. Free trade in agricultural goods is possible in both a free trade agreement or a bilateral agreement, like the one between the EU and Swiss. If the UK would have received the status as Most Favoured Nation, trade costs could have increased significantly, due to both direct tariffs and non-tariff related costs on agricultural goods.

Two years later, Berkum and co-authors wrote a follow up report considering only two possible outcomes of the trade agreement (Berkum et al, 2018). With a free trade agreement as an optimistic scenario, and a pessimistic scenario under which the UK and the EU would trade on Most Favoured Nations terms. Using the price-driven AGMEMOD partial equilibrium model they estimated the impact of the export and the production of tomatoes, beef, pig meat, poultry meat and cheese. In terms of export volume they expected negligible or compensating modest impacts for the optimistic and pessimistic scenarios respectively. In terms of production they estimated a foregone production value in these five sectors of €125m in case of the pessimistic WTO scenario. The authors admit that the model does not take into account the highly efficient logistics concept in the Netherlands, which proves that the Dutch agricultural export flows are determined by other factors than price levels only. Other qualitative issues, summarized in the paper were:

- Fear of different interpretation of rules and regulations.
- Additional documents and inspections always lead to higher costs in terms of human capacity, infrastructure and time.
- Disapproval of cargo at the border implies higher costs for returning the products and/or to find alternative markets elsewhere.

At the end of 2017, Van Oort and co-authors conducted a research at the Impact of the Brexit on regional labour income in the UK and EU. Conclusions of this research were a higher impact of the Brexit on UK compared to EU regions on average, where countries like Ireland, the Netherlands and Germany were expected to be hit the hardest. The second conclusion was an increasing economic inequality in the UK between the poorer regions and the more developed regions like London, which were expected to be hit less due to its high share of production for local use and its high share of exports for extra-EU countries (Van Oort et al., 2017).

More-or-less the same research group published a more comprehensive research with additional insights in October 2020, two months before the definite Brexit. The aim of this research was to estimate the economic opportunities and vulnerabilities of the UK and EU NUTS 2 regions and the sensitivity of those regions to the type of Brexit that would be agreed. Direct tariff and non-tariff related costs and indirect global value chain costs were expected to cause higher vulnerabilities in UK regions compared to EU regions, due to dependency of the UK on EU value chains. With a Leontief Price model they estimated an 1.7% increase of production costs in the UK, 0.4% in the EU on average and 0.8% for the Netherlands. The higher the increase in production costs, the more vulnerable a region or country is. In the Netherlands, the regions, or provinces, of South-Holland and Zeeland faced competitive vulnerabilities. In terms of industries, the agricultural industry was competitive vulnerable and sensitive to the type of Brexit according to their results (Van Oort et al., 2020).

The Organisation for Economic Co-operation and Development (OECD), conducted a similar research to the potential trade effects of Brexit on Dutch exports and production at a sectorial level two years earlier. The authors used a Metro CGE (Computable General Equilibrium) model which used tariff and non-tariff measures (NTM's) that were specific to the Netherlands, this is a huge advantage of this paper since the impact could have differed a lot from the EU on an aggregate level due to diversity in UK trade exposure, degrees of global value chain integration and trade diversification opportunities. To estimate the effect, they used the Most Favoured Nation outcome, hence the results can be seen as an upper bound. According to their estimations, Dutch exports to the UK would drop 17%, total Dutch exports would drop 0.8% and Dutch GDP 0.7%. On a sectorial level, the Dutch agriculture industry was again expected to experience the highest impact with a 22% drop in exports to the UK, followed by a 2.5% drop in total exports. The highest contributors to this drop were meat products, with a 35% drop in exports to the UK and a 13% drop in total exports. The drops in agricultural exports were expected to result in 2% fall in total production, 7.3% decline in land value and a 1-3% decline in labour demand for the agricultural industry (Smith, Arriola, Carrico, & Tongeren , 2019).

What I miss in most of these studies, and models used in these studies, is the right approach to account for the difference in domestic production and re-exports. Lankhuizen and Thissen (2019) wrote about the importance of this distinction in the estimation of the Brexit effect, which was also according to them not yet addressed in the existing literature. Taking re-exports into account correctly is relevant for the registration of bilateral trade to its proper origin or final destination to have an unbiased estimation in trade statistics models. Secondly, it is important from a policy perspective, such as the Brexit, to estimate possible effects of targeted trade policies. The authors show that re-exporting is concentrated in a small number of countries such as the Netherlands, Belgium and Germany, which can be explained by the presence of well facilitated and operating (sea)ports with a well working transport network and logistics infrastructure. Hence, these countries and corresponding supply chains are expected to be more negatively affected by the Brexit in terms of direct re-export value reduction.

Lemmers and Wong (2019) elaborate more on the importance of re-exports in the Netherlands and the possible over- or underestimation of the Brexit effect in the EU-UK trade due to these re-exports. Geography, infrastructure and skills are the main drivers of the so-called Rotterdam-effect in the Netherlands; the import of goods from other countries, especially extra-EU countries, by Dutch traders who re-export to other EU countries. The authors show that Dutch re-exports to the UK account for an important share of total exports to the UK, which proves that the distinction between the different trade flows is important for estimating the Brexit effect.

Brexit was seen as an expected disruption, therefore supply chain resilience (SCR) was needed to prepare for and/or respond effectively to this. Firms and organizations needed to develop their dynamic capabilities by sensing and seizing the opportunities and threats and transforming or reconfiguring their business models, operations and supply chains (Hendry et al, 2018). Firms or supply chains who would be able to transform the threats into opportunities could win competitive edge once the policy was implemented.

Post Brexit

Every year, Wageningen University and CBS publish a report concerning the Dutch agriculture industry in international context. This year's report (Jukema, Ramaekers, & Berkhout, 2022) includes a chapter with the first Brexit effects on the industry. To discuss the effects, the authors focused on the period from 2015 onwards, since 2015 is the last year before the Brexit referendum. Besides the pre-Brexit uncertainties, discussed in previous paragraph, the authors discuss several qualitative and quantitative effects due to all the extra administrative procedures, import tariffs and -quota's for extra-EU products, health certificates, and checks and inspections. Below their findings:

- Companies experienced higher administrative costs and more delays in transport, which is harmful for the perishable products (LNV, 2021)
- Total agricultural export value to the UK (primary, secondary and side products included), went from €9.0b in 2015 to €9.3b in 2020, but decreased again to €9.1b in 2021. This caused a reduction from a 10% to a 7.9% share of the UK as export destination in total Dutch agricultural export.
- Agricultural re-exports from the Netherlands to the UK decreased 33% in 2021 compared to 2020, and 21% compared to 2015. For Dutch agricultural re-exports to other countries there is an increase of 40% in 2021 compared to 2020. The reduction happened completely after the start of the Brexit and is easily explained by the extra import tariffs for products that are not originated in the EU, but also due to the double checks and administrative handling. The port of Rotterdam, with its important role in international trade and transshipment, was also expected to be harmed by the reduction in re-exports to the UK.
- This reduction in re-exports is mirrored by the increase in domestically produced exports to the UK of 11% in 2021 compared to 2020, and 9% compared to 2015. A reasonable cause for this is the low substitutability of Dutch manufactured agricultural goods, **but** an important side note in this development is that not all the regulations were in place from the start of the Brexit. The authors expected a Brexit effect on the Dutch exports in 2022 due to the implementation of new measures. In the meantime, most of these regulations have been postponed again at least until the end of 2023.

Other important findings of these authors were the strong growth of the floriculture export with an export value growth of €514m (44%) from 2020 to 2021, and the switch in most important country of origin for UK agricultural imports, where the Netherlands was replaced by France after three years. I do not agree on this latter point, but I will elaborate more on this in the *Results* chapter of this thesis.

A Brexit-related development which could have a potential impact on the agricultural trade flows from the Netherlands to the UK, now and in the future, is free trade agreements between the UK and origin countries from those re-exports, since the UK is able to implement its own trade policies. UK's devolved governments are not proponents of trade agreements with third countries, since analyses showed that these agreements are unlikely to compensate for increased trade frictions with the EU (Eiser, McEwen, & Roy, 2021). The UK debate of which inter-governmental cooperation model to use in shaping future trade agreements, is not in scope of this research, but it will nonetheless have an impact on the country's leverage in trade negotiations (Melo Araujo, 2019). Despite potential trade agreements, it is not likely that UK ports will gain a competitive advantage to the port of Rotterdam as a hub between extra-EU countries and the EU hinterland, because of the rules of origin and the additional transport costs from the UK to the EU (Garcia-Herrero & Xu, 2016). However, the same rules of origin could make direct trade with the UK for extra-EU countries even more interesting in the case of free trade agreements, which might induce a reduction in Dutch agricultural trade flows to the UK.

The reduction in re-exports was expected to have an impact on the throughput in the port of Rotterdam, but there were other possible developments which could harm the competitive position of the port (Jonkeren, 2021). The Dutch Kennisinstituut voor Mobiliteitsbeleid, research institute for mobility policies, based their expected impacts on the first half year of 2021, the first period after the agreement, and on expectations about the future, resulting from interviews with industry experts and literature studies. Two competitive pillars seemed to have a potential negative effect on the port of Rotterdam.

The settlement of **freeports**, port area's with customs, tax, and tariff advantages for businesses, in the UK might have a potential negative effect on the competitive position of the port of Rotterdam due to decreasing business activities and job employments. A substantial effect was not expected since history proved a limited success of such policies.

Easing the UK **Emission Trading System** could make UK seaports more attractive for vessels than the EU with a more strict Emission Trading System. This could have a potential negative effect on the competitive position of Dutch seaports due to less port calls. A substantial effect was not expected because of the low probability that the UK would not charge any emission fees.

Hypotheses

A research method can be deductive or inductive. A deductive research starts with theory, before deriving hypotheses from this theory and testing these hypotheses with new observations (van Kippersluis, 2018), as I did for my research. In previous paragraphs I discussed the theory, which led to my research hypotheses in this paragraph. With these hypotheses I formulate my expectations on my research question:

What is the effect of the Brexit on Dutch agricultural trade flows to the UK and its corresponding logistics activities in the port of Rotterdam and the larger port environment?

Hypothesis 1 Total trade flows pre-Brexit

The growing Brexit probability and EU-UK trade agreement uncertainties in pre-Brexit years had a negative effect on the Dutch agricultural trade flows to the UK.

This hypothesis is based on the research of Graziano and co-authors, who estimated an impact on EU-UK trade which was twice as high than the impact on UK-EU trade.

Hypothesis 2 Exports of Domestic production

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had no effect on the Dutch agricultural domestically produced export flows to the UK in 2021.

This hypothesis is based on the statement that the first phase of regulations was not expected to have much impact on the domestically produced exports. These exports even experienced a growth in 2021, according to the annual publication by Wageningen University and CBS.

Hypothesis 3 Re-exports

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the Dutch agricultural re-export flows to the UK in 2021.

The studies I discussed in previous paragraphs expected limited effects on the agricultural exports to the UK in case of a free trade agreement. I believe their estimations were lacking at the point they did not consider re-exports as separate flow in their analysis. I expect that the implemented import tariffs for extra-EU originated re-exports cause this negative effect, especially considering relatively high tariffs on agricultural goods, depicted in figure 1 (FAO, 2022).

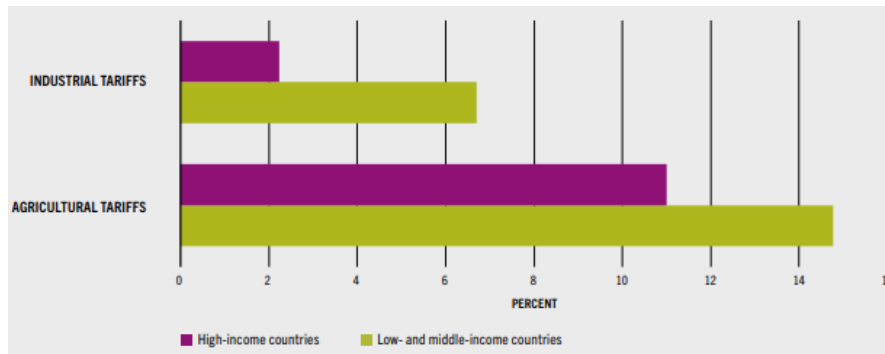


Figure 1 Agricultural and Industrial tariffs (FAO, 2022)

Hypothesis 4 Quasi-Transit

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the Dutch agricultural quasi-transit flows to the UK in 2021.

Despite the characteristic that quasi-transit goods do not become Dutch property at any time in the supply chain, import tariffs have to be paid for extra-EU goods when crossing the EU border. Therefore the effect is expected to be the same as for re-exports.

Hypothesis 5 Exports specializations Greenport West-Holland

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a mixed effect on the export flows of Greenport West-Holland clusters' specialized product groups to the UK in 2021, with a negative effect for fruit and no effect for vegetables and floriculture.

This hypothesis is based on the different characteristics of the three product groups in the Greenport clusters Barendrecht/Ridderkerk and Westland. The expected negative effect for fruit(CN08) is due to the high share of re-exports in total exports of this product group, in contrast to Floriculture(CN06) and vegetables(CN07) that have a high share of domestic production, see table 2.

Year	06 Dutch	06 Re-exports	07 Dutch	07 Re-exports	08 Dutch	08 Re-exports
2017	87,9%	12,1%	83,6%	16,4%	21,8%	78,2%
2018	87,9%	12,1%	83,6%	16,4%	22,0%	78,0%
2019	89,5%	10,5%	83,3%	16,7%	20,6%	79,4%
2020	89,5%	10,5%	81,7%	18,3%	21,4%	78,6%
2021	87,5%	12,5%	81,7%	18,3%	24,3%	75,7%

Table 2 Dutch export/Re-export shares CN06/07/08 (Eurostat)

Hypothesis 6 Throughput port of Rotterdam

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the port of Rotterdam's agricultural throughput to the UK in 2021.

This hypothesis is based on the expected reduction in extra-EU originated re-exports and quasi-transit to the UK, since the port of Rotterdam is such an important hub in world trade and corresponding global supply chains.

Data and research methodology

In the last paragraph of previous chapter, I discussed my expectations with my six research hypotheses. In this chapter I discuss my data collection and mixed methods research methodology. I start with the data collection for my quantitative analysis, followed by describing the econometric difference-in-differences tool which I used to obtain my quantitative results. Finally, I discuss how I used interviews as a qualitative tool to obtain more relevant information for a meaningful interpretation of my results.

Data collection

My first four hypotheses are subject to the different trade flows, discussed in the introduction. According to CBS these trade flow statistics are incorporated in different databanks. Hence, I needed different ways of data collection for my hypotheses.

After reading the annual publication of the Wageningen University and CBS about the agricultural exports in the Netherlands, I noticed that in the appendices some useful tables with domestically produced exports and re-exports data were shown. In order to reproduce the tables I wanted to obtain the original datasets, including the agricultural exports to all countries in the EU, subdivided per product group. I contacted the three authors via LinkedIn and after some time I got in touch with Pascal Ramaekers, statistical researcher at CBS. According to Ramaekers (2022), the best way to reproduce these data tables is to use the trade database *EU trade since 1988 by HS2-4-6 and CN8 (DS-045409)* from Eurostat Easy Comext (Eurostat). The advantage of using a combination of the tables in the annual publications, national accounts, and the data from Eurostat, international trade statistics, is that the difference between both displays the quasi-transit flows (CBS, n.d.). T

For the trade flows true transit, transito transit and entrepot transit, there was no data available or I was not able to disentangle them from the available data. These transit flow concepts are incorporated in qualitative discussions.

By creating query's in the Eurostat Easy Comext databases, see figure 2 below, I was able to set up multiple data sets for my analysis. As an example, the lay-out for the excel output is given in appendix III.

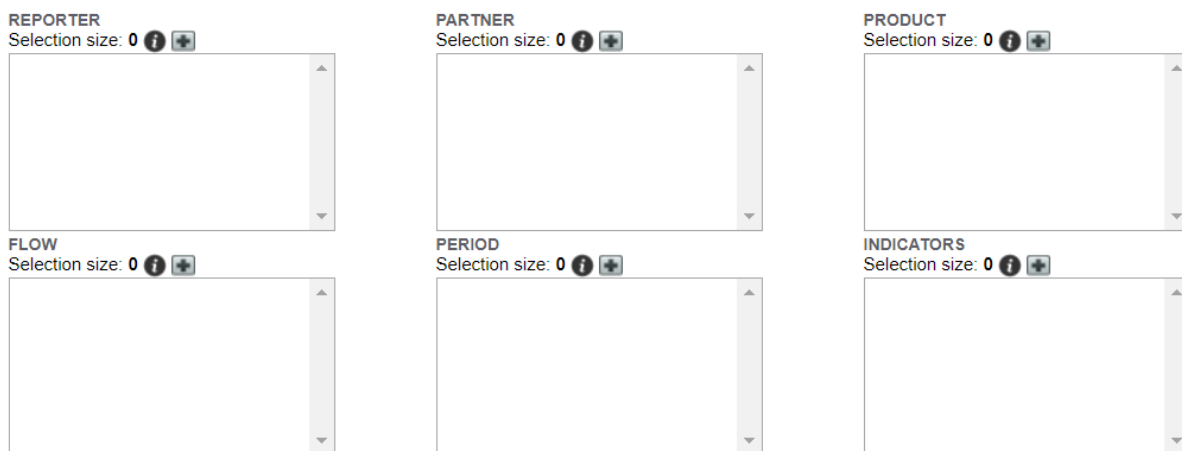


Figure 2 Input boxes Eurostat database

Hypothesis 1 Total trade flow pre-Brexit

For this hypothesis it was not demanded to use a distinction between the different trade flows. Hence I did not need the tables from the annual publications, I just needed the Eurostat data. The input I used for the six boxes to create a query is shown below.

- Reporter** The Netherlands
- Partner** EU26 (without the Netherlands) + UK
- Product** 24 primary product groups & 42 secondary product groups
- Flow** Exports
- Period** Annual numbers from 2010 - 2021
- Indicators** Export value

Hypothesis 2 Exports of Domestic production, Hypothesis 3 Re-exports & Hypothesis 4 Quasi-transit

For all three hypotheses the export table in the annual publication of 2022 was very useful since it showed the total agricultural export numbers from the Netherlands to all other countries, but it also made a distinction between re-exports and domestically produced exports. As I will explain in the next paragraphs, for my difference-in-differences analysis to work, I need at least several years pre-Brexit data and one year post-Brexit data to estimate the effect. After some desk research I was able to find previous annual publications with similar data tables, back to the year 2018.

I combined these data tables with the Eurostat data from the same time periods, to obtain all the required data in one dataset, including the annual numbers for quasi-transit. The input I used for the six boxes to create a query is shown below.

Reporter The Netherlands
Partner EU26 (without the Netherlands) + UK
Product 24 primary product groups & 42 secondary product groups
Flow Exports
Period Annual numbers from 2018 - 2021
Indicators Export value

Hypothesis 5 Exports specializations Greenport West-Holland

For this hypothesis I focused on the total Dutch exports of the three main specializations of South-Holland's agricultural clusters in Barendrecht/Ridderkerk and Westland, namely floriculture, vegetables and fruit. I decided not to make a further distinction in re-exports and domestically produced exports, but just to analyse the impact on the total trade flows to the UK for each of the three product groups. Hence, I just needed the data from Eurostat. The input I used for the six boxes to create a query is shown below.

Reporter The Netherlands
Partner EU26 (without the Netherlands) + UK
Product CN-06 Floriculture, CN-07 Vegetables, CN-08 Fruit
Flow Exports
Period Annual numbers from 2010 - 2021
Indicators Export value

Hypothesis 6 throughput port of Rotterdam

For my sixth hypothesis, regarding the throughput in the port of Rotterdam, there was no data from the national accounts or the international trade statistics, since these required data from the port of Rotterdam is not available publicly. After my interview with M. van Schuylenburg, I was able to receive some data with transshipment volumes to three European regions. The first region includes the destinations UK and Ireland, the second region includes destinations in Scandinavia and the Baltic states and the third region includes destinations in the Iberian and Mediterranean countries. Unfortunately it was not possible to receive this data only for agricultural trade.

Other data

After discussing the first results with some interviewees I received an interesting recommendation to include in my research. In the other parts of my research I analyse the trade flows from the Netherlands to the UK and other EU countries/regions. To study the competitive edge of Dutch exports to the UK, I include an analysis with the developments of other EU countries' exports to the UK. For this analysis I use the data from Eurostat. The input I used for the six boxes to create a query is shown below.

Reporter	EU27
Partner	UK
Product	24 primary product groups & 42 secondary product groups
Flow	Exports
Period	Annual numbers from 2010 - 2021
Indicators	Export value

Research methodology

A mixed methods research is increasing in importance. A research by Mckim (2017) studies the judgements of students who read passages of qualitative, quantitative and mixed methods research. Results showed that the students judged the mixed methods passage as more valuable because it shows more evidence for the findings and interpretations and it gives readers more confidence in the study. I have also used this mixed methods methodology for my research. For my quantitative research I have used the difference-in-differences tool to obtain my results and in my qualitative research I have used interviews as a tool to obtain my results.

Difference-in-differences

The explanation of the difference-in-differences tool is explained by the lectures of Carlos Riumallo Herl, Assistant Professor Applied Economics at the Erasmus School of Economics (Riumallo Herl, 2021).

The difference-in-differences tool is an econometric model that estimates the average treatment effect when certain groups are exposed to an event or intervention and others not. The model is well suited to estimate the effects of sharp changes in the economic environment or changes in governmental policies. The logic of the difference-in-differences tool is explained by two groups, the treatment and control group, and two periods, pre-intervention and post-intervention. The post-intervention trend of the control group represents the counterfactual trend which the treatment group would have followed in absence of the intervention. Any discrepancy in this trend of the treatment group is the causal impact of the intervention. This is illustrated in figure 3 below, where the dark line from *control,before* to *control,after* represents the trend line for the control group, the blue line represents the counterfactual trend for the treatment group in absence of the intervention and the

dark line from *treatment,before* to *treatment,after* represents the actual trend line of the treatment group after the intervention took place. As indicated by the vertical thin blue line, the difference between the counterfactual- and actual trend line of the treatment group represents the effect of the intervention.

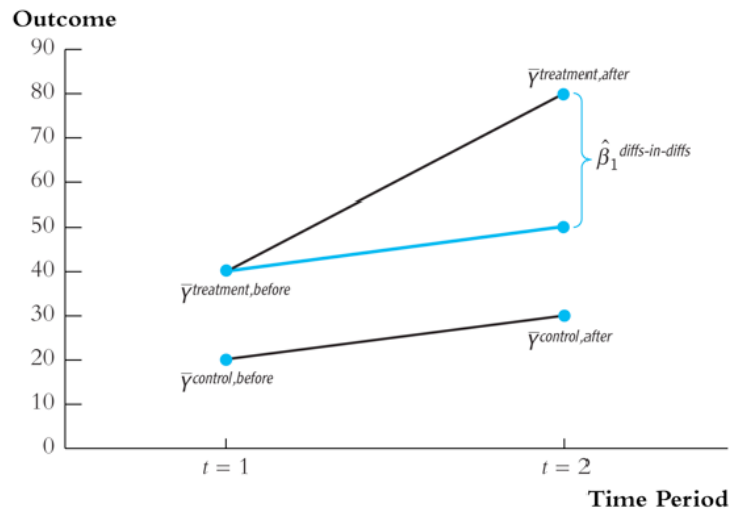


Figure 3 Difference-in-differences example (Riumallo Herl, 2021)

For the estimations to be unbiased, the difference-in-differences model has one assumption that has to hold; The control group should be a valid counterfactual for the treatment in absence of the treatment. This assumption can be divided into two conditions, namely the parallel trend assumption and the stable unit treatment value assumption. For the parallel trend assumption to hold, as it self-explains, the trends should be parallel pre-intervention. Furthermore, no other factors than the intervention change differentially over time for the treatment group, compared to the control group. When there is more than one pre-intervention period available in the data, it is possible to test this parallel trend assumption statistically. The second, stable unit treatment value, assumption entails that the outcome or behaviour of the control group should not be affected by the intervention on the treatment group. This latter assumption cannot be tested statistically but should always be discussed.

To estimate the effect, we define the treatment/control group ($D_i=1/D_i=0$) and post/pre intervention period ($T_i,t=1/T_i,t=0$) as binary variables in the regression. Hence, we get the following equation.

$$Y_{it} = \beta_0 + \beta_1 D_i + \beta_2 T_{it} + \delta D_i T_{it}$$

Figure 4 below presents how to interpret the estimators of the regression. As explained, the difference in the treated outcome and the counterfactual outcome displays the effect of the intervention. Hence, the δ estimator represents the difference-in-differences effect of the intervention.

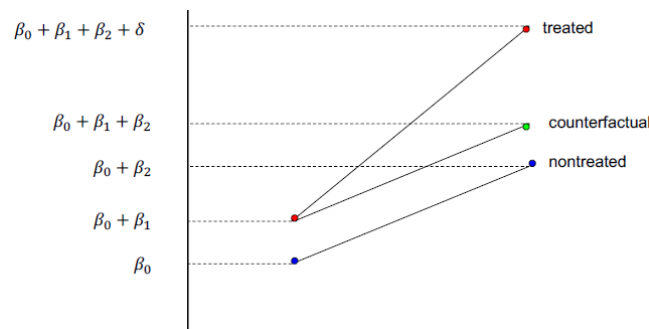


Figure 4 Difference-in-differences estimators (Riumallo Herl, 2021)

The analysis of my research has multiple time periods pre-intervention, which is called generalized regression and makes the equation, shown below, a bit more complex. To estimate the effects, we use λt as the time effects, Dit as the treatment/control group variable, q and m as the amount of years pre- and post-intervention respectively and γt and δt as the estimates for the treated group pre- and post-intervention respectively. Hence, we get the following equation.

$$Y_{it} = \lambda t \sum_{t=-q}^{-1} \gamma t D_{it} + \sum_{t=0}^m \delta t D_{it}$$

Application

The Brexit has been a structural change in the governmental and economic environment and for policies in Europe. Therefore the difference-in-differences tool is well-suited to estimate the effect of this change on Dutch exports to the UK.

As explained, the first step is to determine a treatment and control group. The treatment group in my research is the UK as destination for Dutch agricultural exports, since they are exposed to Brexit and new regulations. Finding a control group as a valid counterfactual is somewhat more comprehensive. All the other 26 EU countries as destinations for Dutch exports are potential control group candidates, since they were together in the EU with the Netherlands and the UK pre-intervention and for them it did not change post-intervention. Before I discuss the control group I have constructed, I want to emphasize one important change I made in the data. Since the control group consists of different countries as Dutch export destinations, the export values range from almost none to more than twenty billion euro's. This wide variance makes it difficult to find the right estimates that we are looking for. Therefore I converted the absolute values to annual growth values to tighten the gap between the EU countries. To construct the right control group as a counterfactual I decided to pick the countries in the EU who belonged, just like the UK, in the top list of Dutch export destinations. In the end I have constructed the control group with the following EU countries: Germany, Belgium, France, Italy, Spain,

Poland, Sweden and Denmark. Constructing a more closely matched control group by matching this subset of the overall control group to the treated group may result in less bias (Basu & Small, 2020). By doing this and converting the absolute values into annual growth values, I was able to validate the parallel trends assumption. The results of this validation are discussed in the next chapter.

The second assumption regarding the stable unit treatment value cannot be tested statistically but need to be discussed. The outcome or behaviour of the control group, in other words the agricultural exports to the eight selected EU countries, should not be affected by the intervention, the Brexit, on the treatment group. In the interviews, which are discussed in later chapters, it was said that Dutch exporters had, in association with the COVID-19 pandemic, good sales opportunities in other countries. These opportunities became more interesting due to new import tariffs on extra-EU originated goods (Alphen, 2022). This argument can reject the stable unit treatment value assumption for the analyses of re-exports and quasi-transit flows. To check this I looked at the export growth development of the most re-exported agricultural product group, fruit, to the eight selected countries. This product group has fourteen categories in total, twelve with import tariffs varying between 2% and 20%, and two without import tariffs (UK Government, 2022). If the extra import tariffs caused a shift in Dutch agricultural re-exports from the UK to the eight EU countries in the control group, a clear difference in growth values to these countries is expected between the non-tariffed categories and the tariffed categories, in favour of the tariffed categories. However, my analysis with Eurostat data showed the opposite of this. Dutch agricultural non-tariffed re-export values to the control group countries increased from €288m to €322m, an annual growth of 12%, and Dutch agricultural tariffed re-export values to the control group countries increased from €647m to €694m, an annual growth of 7% (Eurostat). This provides enough evidence that the Brexit related tariffs do not affect the re-export and quasi-transit behaviour of the control group. Hence, I conclude that the stable unit treatment value assumption holds for all my difference-in-differences analyses.

Stata

The complex equation of the generalized regression is hard to explain or solve manually. Therefore, the statistical software STATA is used for my analysis. The upper table in appendix IV displays a regression output in STATA. This is a random regression output, not used in my analysis. The yellow line of results represents the difference in levels in the first year of data between the treatment and control group, the blue lines of results represent how much a particular outcome changes each specific year and the grey line at the bottom represents the average outcome of the control group in the pre-intervention period. The green lines present the most valuable information of the output. In the chapter *Results* I only use these lines to discuss my analysis. Below, I describe how to interpret the most important columns in this regression output

The first column *Growth* represents the year of the observed annual growth. The next column *Coefficient* represents the estimates of the intervention effect on the annual growth, these estimates represent the γt and δt in the equation pre- and post-intervention respectively. The fifth column $P>|z|$ represents the P-value, this value represents the probability that the test statistic is not in the confidence interval. The lower the P-value, the lower the probability that the magnitude of the estimate (column *Coefficient*) is equal to zero. The P-values are used to test the parallel trend assumption and the significance of the intervention effects.

To test the parallel trend assumption, different steps have to be followed.

1. Formulate the null-hypothesis; *The pre-intervention trends are similar*
2. Formulate the alternative-hypothesis; *The pre-intervention trends differ significantly*
3. Determine the significance level; *The significance level is 5%*
4. Determine test method; *Difference-in-Differences*
5. Calculate and interpret; *All pre-intervention P-values above 5%, we do not reject the null-hypothesis. See chapter Results.*

To estimate the intervention effect, the same steps have to be performed.

1. Formulate the null-hypothesis; *There is no intervention effect*
2. Formulate the alternative-hypothesis; *There is a significant intervention effect*
3. Determine the significance level; *The significance level is 5%*
4. Determine tool to test; *Difference-in-Differences*
5. Calculate and interpret; *Post-intervention P-value above 5%, we do not reject the null-hypothesis. See chapter Results.*

The results of the regression output and test are also presented visually, see the figure below in appendix IV as an example. As discussed, the γt dots represent the pre-intervention estimates which have to be non-significant in order to have a parallel trend. This is the case when 0 is included in the interval boundaries around the dots. The δt dots represent the post-intervention period, which have to be significant to have an intervention effect. This is the case when 0 is not included in the interval boundaries around the dots.

Interviews

For the qualitative part of my research I have used interviews as a tool to obtain more relevant information and a better interpretation of my quantitative results. To do this, I decided to include multiple actors in the supply chain to obtain the desired results. Before I will elaborate more on the interviewees, I first discuss my interview approach.

I started with the interviews after I had my first quantitative results. Presenting and discussing these results was, after a short introduction, the start of every interview. During this part of the interviews I was also interested in their experiences of trade flow growth trends towards the UK. Thereafter I asked them about other Brexit related bottlenecks due to new regulations and formalities. Furthermore I was interested in the role of IT and supply chain collaboration as a solution for these bottlenecks. To finalize my interviews I asked the interviewees about their opinion and expectations about future developments and their potential impact on Dutch trade flows to the UK. Before submitting this thesis, the citations were once again discussed with the interviewees for approval.

The interviewees, their company and the company's location and role in the supply chain are listed in table 3 below.

Interviewee	Dane Dokman	Interviewee	Egbert van Alphen
Function	Sales	Function	Managing Director
Company	T.O.F.F. BV	Company	DIJCO
Role of company	Importer/Exporter	Role of company	Haulier
Location	Barendrecht	Location	Bleiswijk/Barendrecht
Interviewee	Louis Patty	Interviewee	Robin Westerholt
Function	Expedition	Function	Sales Manager
Company	Verdi Import	Company	P&O Ferries
Role of company	Importer/Exporter	Role of company	Carrier + Terminal
Location	Barendrecht	Location	Rotterdam
Interviewee	Mike de Waard	Interviewee	Daco Sol
Function	Sales Manager	Function	Program Manager Logistics
Company	RedStar	Company	GroentenFruithuis
Role of company	Producer/Exporter	Role of company	Branche Organisation
Location	De Lier	Location	The Netherlands
Interviewee	Marcel van Bruggen	Interviewee	Eline van den Berg
Function	Commerical Logistics Manager	Function	Logistics Supply Chain Expert
Company	ABC Logistics	Company	Royal FloraHolland / Greenport W-H
Role of company	Logistics Service Provider	Role of company	Cooperation cutflowers and plants
Location	Poeldijk	Location	Westland
Interviewee	Viktor Vijverberg	Interviewee	Maurits van Schuylenburg
Function	Sales Manager	Function	Business Development Manager
Company	Freight Line Europe B.V.	Company	Port of Rotterdam
Role of company	Logistics Service Provider	Role of company	Port Authority
Location	Maasdijk	Location	Rotterdam

Table 3 Interviewee information

Results

In this chapter I discuss the results of my difference-in-differences analysis and interviews. To get to my desired results I used the statistical software STATA. The STATA commands I used for my analysis are copied in appendices V, VI and VII. The results of the interviews are used as additional insights for the quantitative paragraphs but are also added to the qualitative results at the end of this chapter.

Dutch agricultural total trade flows to the UK

First, let me recall my hypothesis regarding the effect of the Brexit on the Dutch agricultural total trade flows to the UK.

The growing Brexit probability and EU-UK trade agreement uncertainties in pre-Brexit years had a negative effect on the Dutch agricultural trade flows to the UK.

Several interviewees confirm the uncertain and unclear pre-Brexit period. Daco Sol (2022), Program Manager Logistics at branche organization GroentenFruit Huis, says the following; ‘firms in the agriculture industry were waiting for regulations and tried to start as much preparations as possible, but due to the uncertain outcome of the trade agreement it was hard to know where and how to adjust and optimize business activities’. This is confirmed by Eline van den Berg (2022), Logistics Supply Chain Expert at Royal FloraHolland and Logistics Coordinator at Greenport West-Holland, who added to this; ‘all the postponements of regulations pre-Brexit did not contribute to a confident industry’.

When we look at the trend line of total Dutch agricultural trade flows to the UK from 2010 onwards, see figure 5, we see a clear break in the upward trend line at 2016/2017, the period just after the Brexit referendum. Figure 6 shows that the trend line for non-agricultural trade flows is similar to the trend line for agricultural trade flows until 2019, thereafter we see a clear difference between the trend lines.

If we compare both figures, we see that the non-agricultural trade flows experienced a substantial decrease in 2020. This difference can be explained by the statement that food is a necessity for people and therefore less sensitive for disruptions such as the COVID-19 pandemic (Jukema, Ramaekers, & Berkhout, 2022). If we then look at both trend lines in 2021 we see again a strong decrease in non-agricultural trade flows to the UK and a stable trend line for the agricultural trade flows to the UK. This difference can be explained by the shares of the different trade flows, discussed separately in subsequent paragraphs, in total trade flows for each of the two categories, see table 4.

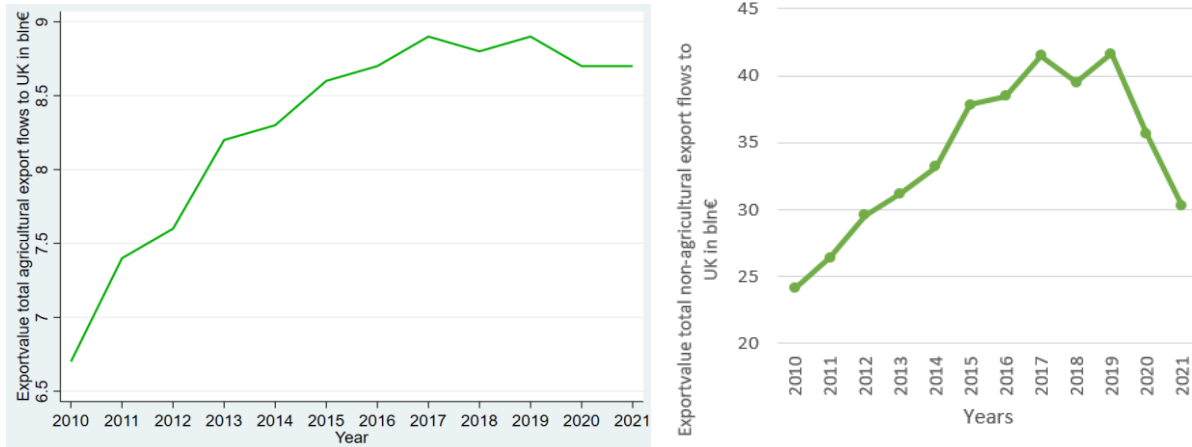


Figure 5 Trend total agricultural flow & Figure 6 Trend total non-agricultural flow (Eurostat)

Year	Agri Dutch%	Agri Re-export%	Agri Quasi%	Non-Agri Dutch%	Non-Agri Re-export%	Agri Quasi%
2010	77%	19%	4%	43%	54%	3%
2011	76%	20%	4%	44%	52%	4%
2012	76%	21%	3%	40%	53%	7%
2013	74%	23%	4%	41%	51%	7%
2014	73%	23%	3%	37%	50%	13%
2015	73%	23%	4%	34%	42%	25%
2016	72%	24%	4%	36%	43%	20%
2017	72%	24%	3%	34%	40%	26%
2018	73%	24%	4%	36%	45%	19%
2019	73%	24%	3%	34%	41%	24%
2020	71%	26%	2%	33%	42%	25%
2021	81%	18%	1%	59%	39%	2%

Table 4 Shares Dutch re-exports and quasi transit (Eurostat)

Back to my hypothesis. Figure 5 is in line with the expectations, but there are other potential developments which could have caused this trend break. To assess this I used the counterfactual trend, as discussed in previous chapter, which presents the UK trend if there would have been no Brexit referendum in 2016. For this hypothesis the difference-in-differences set-up is somewhat different as for the rest. Here, I do not use the pre-Brexit years up until 2020 as pre-intervention period, but I use the pre-Brexit referendum years up until 2015 as pre-intervention period and the years thereafter as post-intervention period.

Figure 7 shows the UK trend line and the counterfactual trend line of the annual growth in periods 2011-2016 and 2016-2021. This figure shows a clear parallel trend pre-Brexit referendum, and a clear non-parallel trend post-Brexit referendum. This descriptive information could support my hypothesis. However there is one important element in this figure that causes bias in the trend lines and that is the year 2021, the first year after the definite Brexit. When we drop this year from the data, we get a completely different picture if we compare the trend lines of periods 2011-2016 and 2016-2020, see

figure 8. The trend lines are now parallel both pre- and post-Brexit referendum, but the counterfactual trend line is now above the UK trend line post-Brexit referendum. The growth values in the figure explain this switch. In the year up to 2015, the export growth values to the UK are at the top half of all export growth values, but from 2016 to 2020 we see that the export growth values to the UK are clearly at the bottom half.

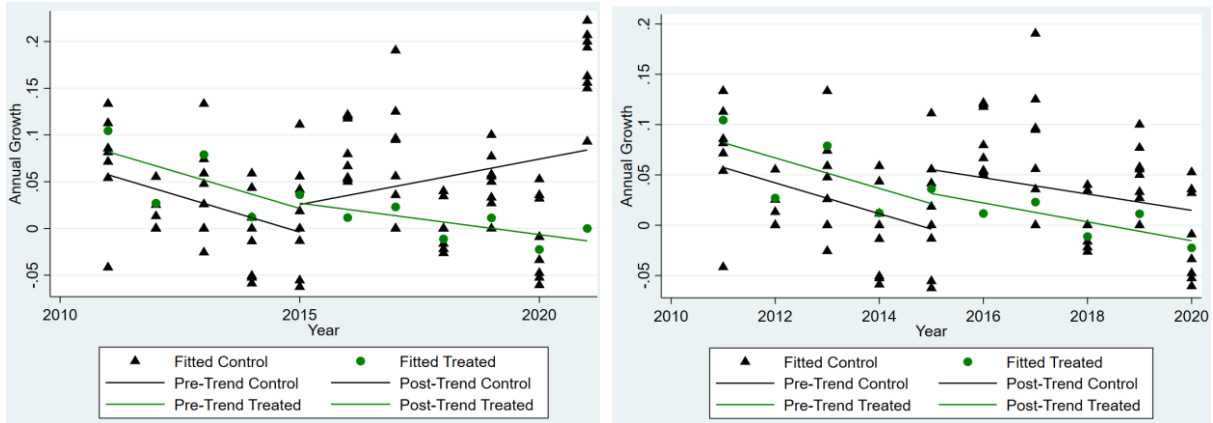


Figure 7 Annual growth total flow 11-16 16-21 & Figure 8 Annual growth total flow 11-16 16-20 (Eurostat)

If we interpret both figures, we see a clear parallel trend pre-Brexit referendum but the post-Brexit referendum effect is a bit ambiguous. Therefore it is even more important to test this statistically with the difference-in-differences regression output in table 5.

Starting with the parallel trends assumption test, we see that the years in the pre-Brexit referendum period all have a very low or negligible magnitude and a P-value above 0.80. Since all P-values are above the 5% significance level, I do not regret the null-hypothesis that the pre-Brexit referendum trends are similar. Hence, the parallel trends assumption holds and the control group is a valid counterfactual.

Growth	Coefficient	Std. err.	z	P> z	[95% conf. interval]	

Treated#Year						
1 2012	-.0103701	.0643326	-0.16	0.872	-.1364596	.1157194
1 2013	.0139962	.0643326	0.22	0.828	-.1120933	.1400857
1 2014	-.0057421	.0643326	-0.09	0.929	-.1318316	.1203474
1 2015	-.0014559	.0643326	-0.02	0.982	-.1275454	.1246336
1 2016	-.0968517	.0643326	-1.51	0.132	-.2229412	.0292377
1 2017	-.0774531	.0643326	-1.20	0.229	-.2035426	.0486364
1 2018	-.0381553	.0643326	-0.59	0.553	-.1642448	.0879342
1 2019	-.0643466	.0643326	-1.00	0.317	-.1904361	.0617429
1 2020	-.0377365	.0643326	-0.59	0.557	-.163826	.088353
1 2021	-.1987338	.0643326	-3.09	0.002	-.3248233	-.0726443

Table 5 STATA regression output total trade flow

Looking at the results post-Brexit referendum, it can be seen that all the years have negative magnitudes between 3.8 and 9.7%, with highest negative effect in the first two years post-Brexit referendum. However, in all these years the P-value is above 0.13. Since all P-values are above the 5% significance level, I do not regret the null-hypothesis that the post-Brexit referendum effect is equal to zero. Hence, looking at this table I conclude that the growing Brexit probability and EU-UK trade agreement uncertainties in pre-Brexit years did not have a significant effect on the annual growth of total Dutch agricultural trade flows. Despite that it was hard for firms to start with their Brexit preparations due to all the uncertainties, sensing, seizing and adjusting to the Brexit threats and opportunities was of great importance in that period. More of that in later paragraphs.

We do see, however, that the P-value for the Brexit effect on total Dutch agricultural trade flows to the UK in 2021 is only 0.002. This could mean a potential definite Brexit effect. Before interpreting these results, I first discuss figure 9, with the UK and counterfactual trend lines pre-Brexit 2011-2020 and post-Brexit 2021. This figure shows a somewhat similar but not clear parallel trend Pre-Brexit, which makes sense since the UK growth values went to the bottom half of the observations from 2016 onwards.

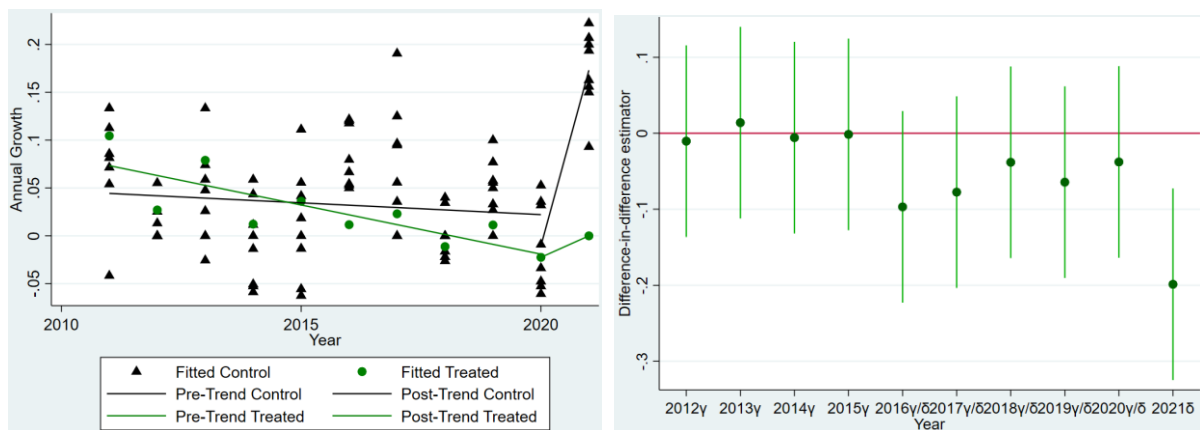


Figure 9 Annual growth total flow 11-20 20-21 & Figure 10 Visual D-I-D Regression effects total flow (Eurostat)

To test the parallel trend pre-Brexit statistically, I recall the regression output in table 5. Combining the pre- and post-Brexit referendum years provides the pre-Brexit period. Since I have concluded that all these years had a P-value of at least 0.13, I do not regret the null-hypothesis that the pre-Brexit referendum trends are similar at a 5% significance level. Hence, the parallel trends assumption holds and the control group is a valid counterfactual.

Looking at the post-Brexit 2020-2021 trend line in figure 9, it can be seen that the Dutch agricultural trade flows to the UK experienced zero growth and the counterfactual observations experienced a growth of 10 up to 25%. This substantial growth for the Dutch agricultural exports to the counterfactual countries can be explained by the recovery of the COVID-19 pandemic and its disruptions (Creemers

et al., 2021). The valid counterfactual trend line displays the trend for the Dutch agricultural trade flows to the UK if there would have been no Brexit at the beginning of 2021. Therefore the difference between these trend lines displays the Brexit effect. Recalling the post-Brexit line in the regression output, the definite Brexit, with phase one of the new regulations and formalities, had a negative effect on the annual growth of Dutch agricultural trade flows to the UK of 19.9%. Since the P-value is only 0.002 I do reject the null-hypothesis and conclude that there is enough evidence that this effect is significant at a 5% significance level. Figure 10 displays the differences-in-differences estimates of the regression output visually. This effect on total trade flows is discussed per trade flow in subsequent paragraphs.

Dutch agricultural domestically produced exports to the UK

First, let me recall my hypothesis regarding the effect of the Brexit on the Dutch agricultural domestically produced exports to the UK.

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had no effect on the Dutch agricultural domestically produced export flows to the UK in 2021.

When we look at the trend line of total Dutch agricultural domestically produced exports to the UK from 2018 onwards, see figure 11, we see a downward trend in the year 2020, but a steep upward trend in the first year after the definite Brexit. This four-year figure is almost in sync with the four-year figure for non-agricultural domestically produced export flows to the UK, as we see in figure 12.

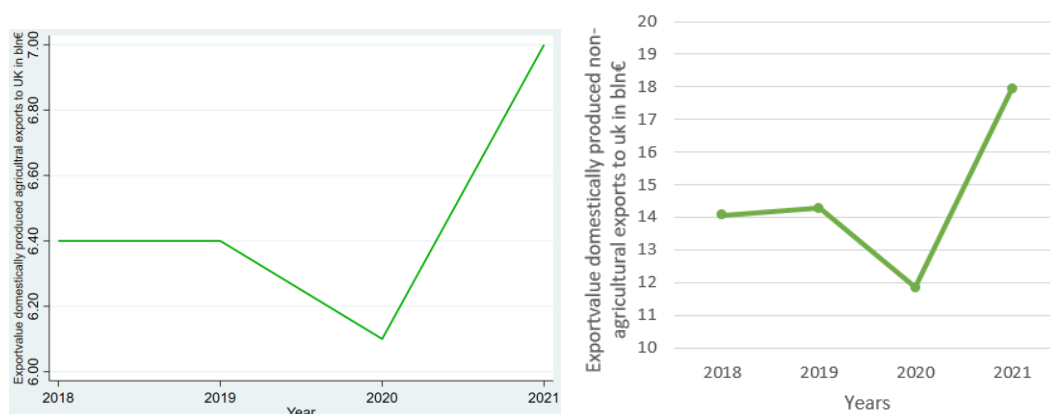


Figure 11 Trend domestic agricultural exports to UK & Figure 12 Trend domestic non-agricultural exports to UK (Eurostat)

Figure 11 is in line with the expectations, but exports to other countries might have experienced even greater growths. To assess this I used the counterfactual trend, which presents the UK trend if there would have been no Brexit in 2021. Figure 13 shows the UK trend line and the counterfactual trend line of the annual growth in periods 2019-2020 and 2020-2021. This figure shows a clear parallel trend

pre-Brexit, and a parallel trend post-Brexit. This information supports both the parallel trends assumption as my hypothesis descriptively.

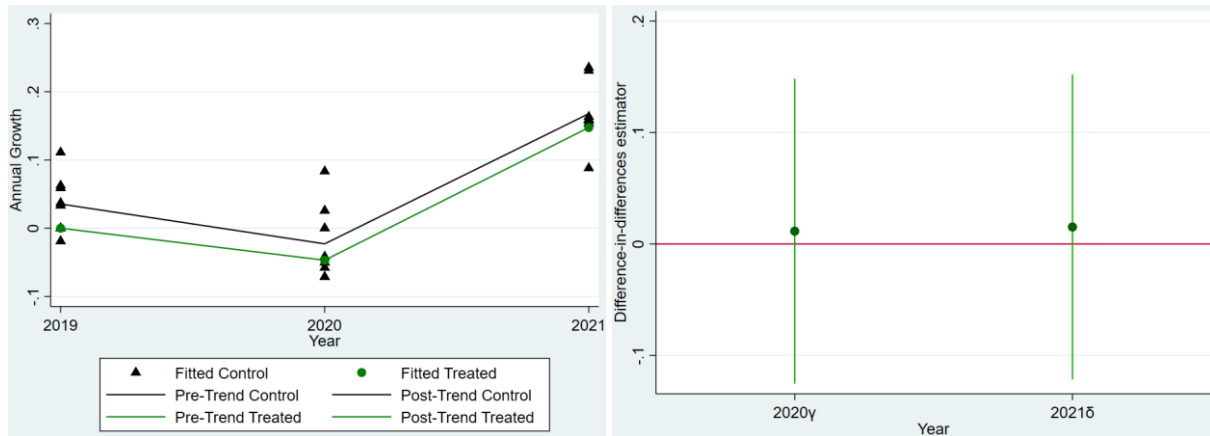


Figure 13 Annual growth domestic exports 19-20 20-21 & Figure 14 Visual D-I-D Regression effects domestic exports (Eurostat)

With the regression output of Stata in table 6, it can also be tested statistically. Starting with the parallel trends assumption test, we see that the year in the pre-Brexit period has a very low or negligible magnitude and a P-value above 0.85. Since the P-value is above the 5% significance level, I do not regret the null-hypothesis that the pre-Brexit trends are similar. Hence, the parallel trends assumption holds and the control group is a valid counterfactual.

Growth_Dut~t	Coefficient	Std. err.	z	P> z	[95% conf. interval]
Treated#Year					
1 2020	.0115017	.0698235	0.16	0.869	-.1253498 .1483532
1 2021	.0152348	.0698235	0.22	0.827	-.1216167 .1520864

Table 6 STATA regression output domestically produced exports

Looking at the results post-Brexit, it can be seen that 2021 also has a very low or negligible magnitude and a P-value above 0.80. Since the P-value is above the 5% significance level, I do not regret the null-hypothesis that the post-Brexit referendum effect is equal to zero. Hence, I conclude that the definite Brexit, with phase one of the new regulations and formalities, did not have a significant effect on the annual growth of Dutch agricultural domestically produced exports. This non-significant effect is also visible in figure 14.

The announced additional regulations for 2023 might induce a potential delayed Brexit effect. According to Sol it has two sides. Both phytosanitary and veterinary health certificates, live checks, inspections and corresponding additional costs may result in less supply for domestically produced agricultural exports to the UK. However, as Sol explains, a well-prepared Dutch agriculture industry and its supply chain may result in a competitive edge and therefor increased domestically produced exports. Sol mentions several aspects which are important for this; clear domestic regulations, efficient and effective administrative and logistical methods, professionalism and work ethic (Sol, 2022).

Another development which could have a potential negative effect on the Dutch domestically produced agricultural exports to the UK in the future, is the UK's self-sufficiency. When we look at the UK's self-sufficiency level for food in 2016, it was only 54%. 27% of all consumed food in the UK was imported from the EU, with the Netherlands as the largest exporter (ABN Amro, 2017). The National Farmers Union, the largest agriculture company of the UK, published a blueprint report that says that the UK wants to become global leader in climate-friendly food production, to become more self-sufficient but also to increase their position in international trade (National Farmers Union, 2022). Viktor Vijverberg, Sales Manager at Freight Line Europe, explains his view on this. 'The UK has too much trouble with becoming more self-sufficient, last year their self-sufficiency level even decreased compared to the years before. They lack in knowledge and skills and it is hard for them to produce the quality that they demand from their imported goods. Their own regulations are also not supportive in becoming self-sufficient and their current position in negotiations exposes this' (Vijverberg, 2022). In 2006, the Eastern European immigrants were seen as an impulse for the British economy by filling the labour shortages in industries such as hospitality, construction and agriculture (DeStandaard, 2006). Ten years later, these Eastern European workers in the UK were driven away by the fall in the pound, anti-immigrant racism, but also due to Britain's vote to leave the EU (Reuters, 2016). As a result, UK's agriculture industry is again experiencing substantial labour shortages since the Brexit and this already affected the industry badly. The Environment, Food and Rural Affairs Committee of the UK's House of Commons recently wrote a report (2022) to the UK government about their serious concerns for the industry. Marcel van Bruggen, Transport Manager at ABC Logistics adds to this, 'for now we see that the UK has too much trouble by becoming more self-sufficient, perhaps in ten years or so we can see a shift in this' (Bruggen, 2022). Other interviewees confirm the thoughts that the UK will not become a self-sufficient agriculture producer on short term.

Dutch agricultural re-exports to the UK

First, let me recall my hypothesis regarding the effect of the Brexit on the Dutch agricultural re-exports to the UK.

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the Dutch agricultural re-export flows to the UK in 2021.

When we look at the trend line of total Dutch agricultural re-exports to the UK from 2018 onwards, see figure 15, we see an upward trend in the year 2020, but a steep downward trend in the first year after the definite Brexit. This is exactly the opposite from the trend of the domestically produced exports to the UK, which we saw in figure 11. Main drivers of the increase in 2020 are the annual export

growth values of fruits, cocoa, oil seeds and oleaginous fruit, and cattle feed (Eurostat). These product groups also had the highest shares of re-exports in total exports in 2020 (Jukema, Ramaekers, & Berkhout, 2021). A potential cause for this might be the role of the port of Rotterdam during the COVID-19 pandemic as Europe’s leading agriculture port, being the fastest route to freshness and having the biggest capacity of reefer plugs in the world and the biggest cold store capacity in Europe (Port of Rotterdam, 2021).

If we compare the agricultural re-exports to the UK with the non-agricultural re-exports to the UK, see figure 16, we see that the non-agricultural re-exports experienced a substantial decrease in 2020. This difference can again be explained by the statement that food is a necessity for people and therefore less sensitive for disruptions such as the COVID-19 pandemic (Jukema, Ramaekers, & Berkhout, 2022).

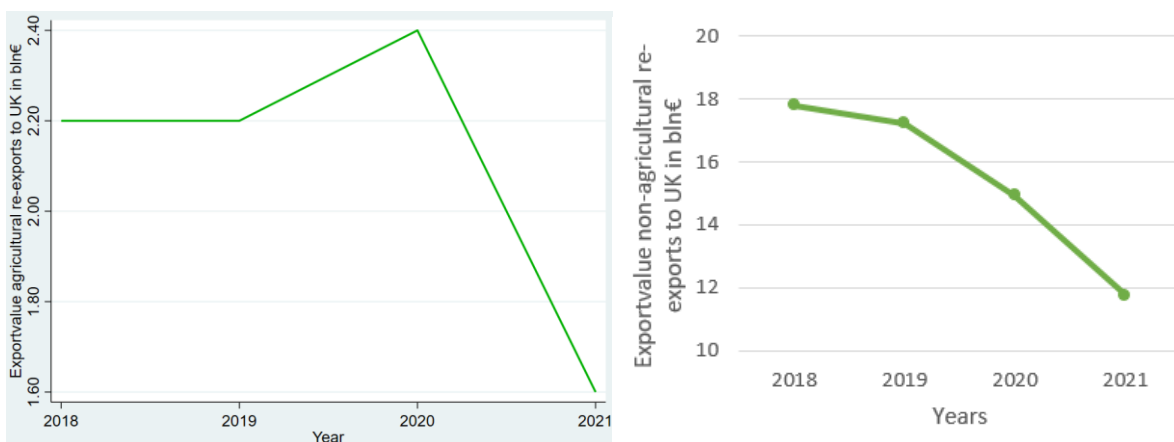


Figure 15 Trend agricultural re-exports to UK & Figure 16 Trend non-agricultural re-exports to UK (Eurostat)

Nevertheless, if we look at the values in 2021, we see an even steeper trend downwards. This is in line with my expectations, but re-exports to other countries might have experienced the same or even greater reductions. To asses this I used the counterfactual trend, which presents the UK trend if there would have been no Brexit in 2021. Figure 17 shows the UK trend line and the counterfactual trend line of the annual growth in periods 2019-2020 and 2020-2021. This figure shows a near parallel trend pre-Brexit, and a clear non-parallel trend post-Brexit. This information supports both the parallel trends assumption as my hypothesis descriptively.

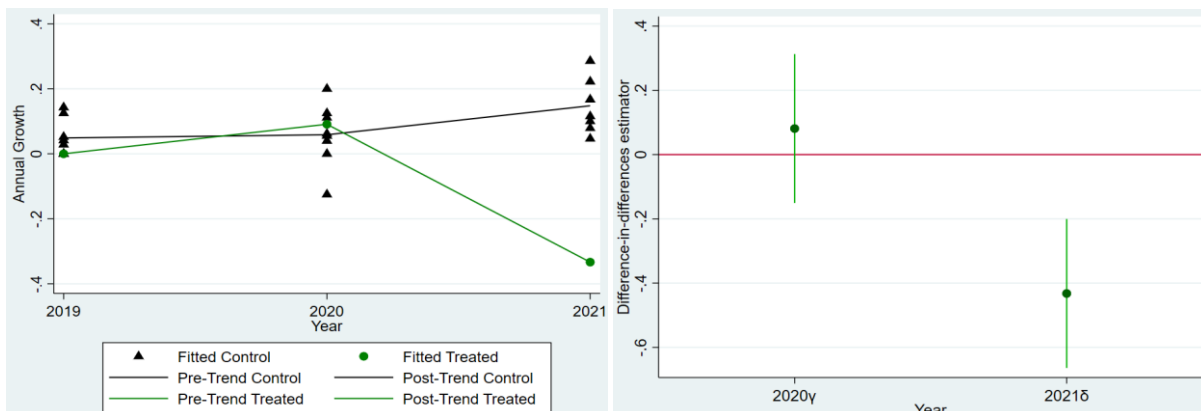


Figure 17 Annual growth re-exports 19-20 20-21 & Figure 18 Visual D-I-D Regression effects re-exports (Eurostat)

With the regression output of Stata in the table 7 it can also be tested statistically. Starting with the parallel trends assumption test, we see that the estimate in the pre-Brexit period has a P-value of 0.49. Since the P-value is above the 5% significance level, I do not regret the null-hypothesis that the pre-Brexit trends are similar. Hence, the parallel trends assumption holds and the control group is a valid counterfactual.

Growth_Ree~t	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
Treated#Year						
1 2020	.0811151	.1182653	0.69	0.493	-.1506805	.3129108
1 2021	-.4323421	.1182653	-3.66	0.000	-.6641377	-.2005465

Table 7 STATA regression output re-exports

Looking at the results post-Brexit, it can be seen that the estimate of 2021 has a magnitude of -0.432 and a P-value of 0.000. Hence I conclude that the definite Brexit, with phase one of the new regulations and formalities, had a negative effect on the annual growth of Dutch agricultural re-exports to the UK of 43.2%. Since the P-value is only 0.000 I do reject the null-hypothesis and conclude that there is enough evidence that this effect is significant at a 5% significance level. This significant effect is also visible in figure 18.

The effect on re-exports is also observed when we look at the percentages of EU and extra-EU imports in the UK. Figure 19 shows a clear post-Brexit increase in the extra-EU share of UK imports of vegetables and fruit which provides additional evidence for the shift from re-exports to more direct exports from extra-EU countries (Boon J. , 2022).

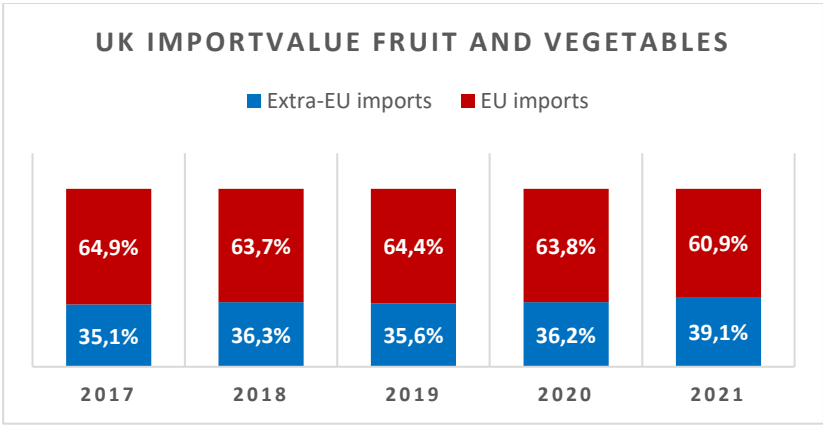


Figure 19 UK EU and extra-EU imports of vegetables and fruit 2017-2021 (Boon J. K., 2021)

During the pre-Brexit years, there were already great concerns by re-exporting firms who expected their market share to shrink due to the expected pricing of extra-EU goods to the UK (Sol, 2022). Verdi Import, whose core business is extra-EU imports, experienced this expected loss in market share. ‘Our exports to the UK were 5% EU and 95% extra-EU originated. When the Brexit was a fact we saw the export volumes shrinking over time. Therefore we decided to quit our business to the UK, apart from

a few exceptions. While import tariffs to the UK used to be 0%, additional import tariffs have been paid nowadays for extra-EU re-exports. Therefore the UK demand for our re-exported goods lacks, since it is more favourable now for UK customers to import directly from extra-EU countries. Especially because of the post-Brexit trade agreements between the UK and those countries, with lowered tariffs agreed' (Patty, 2022).

The latter is indeed what we see happening since the UK left the EU. The UK already established EU-like agreements with countries and custom unions world-wide, including agreements with important extra-EU re-export origins such as South Africa and Costa Rica (UK government, 2022). But not all negotiations run that smooth, with the UK-Mercosur (Brazil, Argentina, Paraguay and Uruguay) trade agreement as an example, where parties on both sides of the table do not agree on several terms like the phytosanitary and veterinary measures (Bueno, 2022). The industry experts interviewed have aligned expectations about this development, re-export and quasi-transit flows will be hit even more with expansion of liberalised trade agreements between the UK and extra-EU countries.

Dutch agricultural quasi-transit to the UK

As discussed in chapter *Data and research methodology*, an advantage of using a combination of the annual accounts of CBS and the international trade statistics of Eurostat is the calculation of quasi-transit trade flows. The disadvantage of this is that the data is, in my opinion, not completely compatible and therefore not accurate. Evidence of this lies in the total value of quasi transit trade, discussed in an article by CBS (2022). In this article they communicate a decrease of Dutch quasi-transit to the UK in 2021 of €9b to a value of €2.5b. These values are substantially different from the outcomes of the data that I use, which can be observed after adding up the values of figures 20 and 21. Nevertheless, I conducted the same difference-in-differences analysis to test my hypothesis.

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the Dutch agricultural quasi-transit flows to the UK in 2021.

Looking at figures 20 and 21, we see that the agricultural quasi-transit trend is similar to the non-agricultural quasi-transit trend. Both experience a decrease during the COVID-19 pandemic and this decrease continued after the Brexit, or even got worse for the non-agricultural quasi-transit flows.

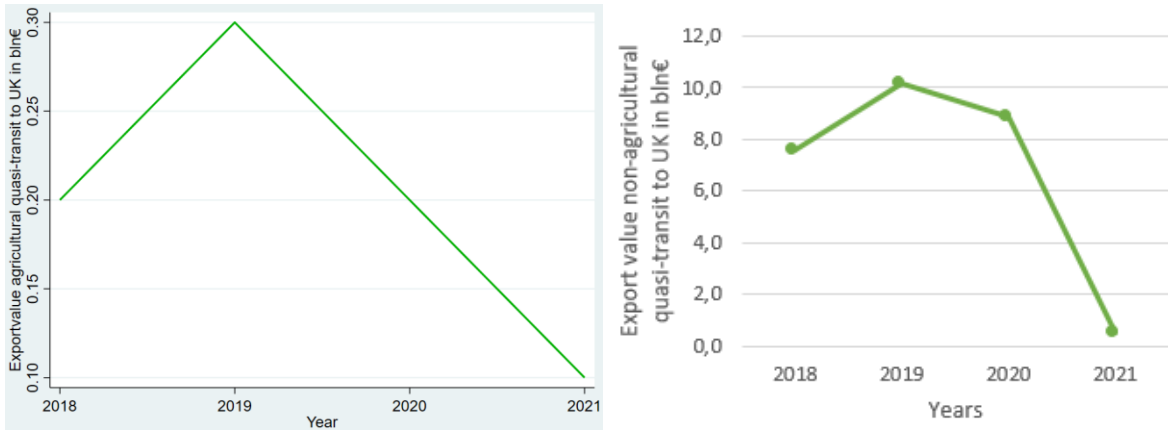


Figure 20 Trend agricultural quasi-transit to UK & Figure 21 Trend non-agricultural quasi-transit to UK (Eurostat)

This agricultural trend is in line with my expectations, but quasi-transit flows to other countries might have experienced the same or even greater reductions. To assess this I used the counterfactual trend, which presents the UK trend if there would have been no Brexit in 2021. Figure 22 shows the UK trend line and the counterfactual trend line of the annual growth in periods 2019-2020 and 2020-2021. This figure shows no clear parallel trend pre-Brexit and the trends diverge post-Brexit. This information rejects the parallel trend assumption descriptively, which could make my control group invalid.

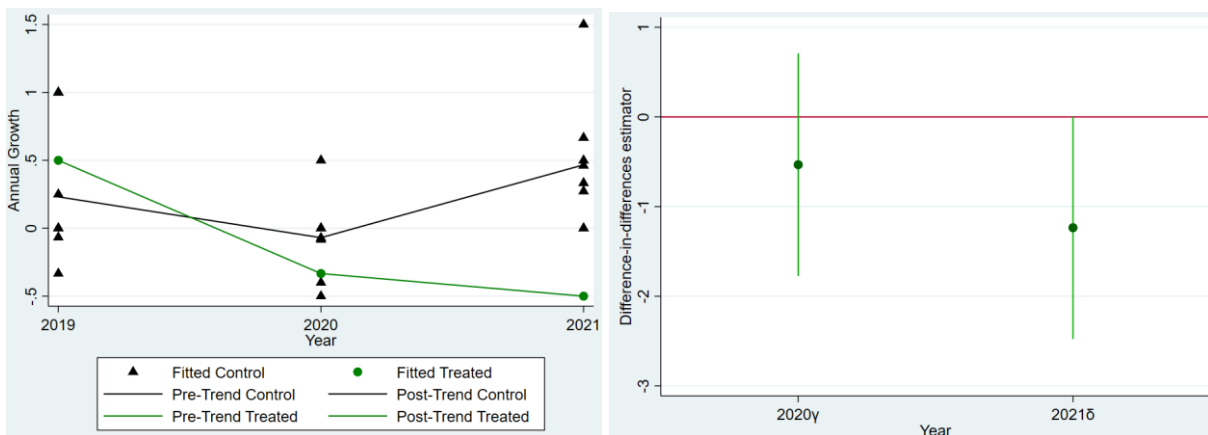


Figure 22 Annual growth quasi-transit 19-20 20-21 & Figure 23 Visual D-I-D Regression effects quasi-transit (Eurostat)

However, with the regression output of Stata in table 8 it can also be tested statistically. Starting with the parallel trends assumption test, we see that the year in the pre-Brexit period has a P-value of 0.4. Since the P-value is above the 5% significance level, I do not regret the null-hypothesis that the pre-Brexit trends are similar. Hence, contrary to previous descriptive expectations, the parallel trends assumption holds and the control group is a valid counterfactual.

Growth_Qua~t	Coefficient	Std. err.	z	P> z	[95% conf. interval]
Treated#Year					
1 2020	-.5327381	.6336327	-0.84	0.400	-1.774635 .7091593
1 2021	-1.235533	.6336327	-1.95	0.051	-2.477431 .0063641

Table 8 STATA regression output quasi-transit

Looking at the results post-Brexit, it can be seen that 2021 has a negative estimate of -1.236 and a P-value of 0.051 . Statistically, I cannot reject the null-hypothesis that the Brexit effect is equal to zero, since the P-value is above the 5% significance level. However, looking at the fact that the P-value is only 0.01 above the threshold, the substantial magnitude of the effect, the descriptive details in figure 22 and the inaccuracy of the quasi-transit flow data, I decide to reject the null-hypothesis and assume that this effect is significant. Hence I conclude that the definite Brexit, with phase one of the new regulations and formalities, had a negative effect on the annual growth of Dutch agricultural quasi-transit flows to the UK of 123.6% .

The import tariffs on extra-EU originated agricultural re-exports or quasi-transit flows to the UK make these type of trade flows less interesting. However, actors in the industry are always seeking for opportunities to retain the supply-chain as efficient as possible, with the lowest costs. According to the industry's experts interviewed, there is a switch going on to the other transit flows. RedStar, tomato producer and exporter in Greenport cluster Westland, decided to start with transito transit to the UK market. 'For Moroccan tomato growers it became more interesting to export directly to the UK. We saw an opportunity to export directly from our Moroccan partners to our customers in the UK. These trade flows often do not even cross the Dutch border but are transported via Calais in France. Off course this results in an extra margin for us' (Waard, 2022).

Besides transito-transit there are also developments of entrepot-transit in the industry, as Vijverberg explains. 'Some parties seize the opportunities of the market by importing containers to the Netherlands without customs clearance before being re-exported to the UK. Thereby they are able to avoid the import tariffs. The port of Rotterdam is an attractive hub in these transit flows with all the crossing trade flows and its competitive advantage over the ports in the UK. My expectations are that more parties will specialize in these trade flows to the UK' (Vijverberg, 2022). Extra-EU originated goods can be re-exported to third countries, as the UK is after the Brexit, from a customs-entrepot or temporary storage facility, with the right documents, to avoid double payment of import tariffs (Douane Belastingdienst, 2020).

Greenport West-Holland clusters

As discussed in the introduction, Greenport clusters Barendrecht/Ridderkerk and Westland are specialized in the production, export and distribution of the agricultural product groups floriculture, vegetables and fruit, CN codes 06, 07 and 08 respectively. Let me recall my hypothesis regarding the effect of the Brexit on the Dutch exports of these product groups to the UK.

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a mixed effect on the export flows of Greenport West-Holland clusters' specialized product groups to the UK in 2021, with a negative effect for fruit and no effect for vegetables and floriculture.

In the next paragraphs I discuss the results for each product group separately.

Floriculture

Starting with Floriculture, CN06, we see a mirrored trend of the export value to the UK, figure 24, when we compare it with the total of all agricultural product groups, figure 25. Floriculture experienced the largest absolute growth in export values of all agricultural product groups, not only to the UK but in general. This latter can be explained by the strong price increases after the COVID-19 pandemic and corresponding developments (Berg, 2022). People started to work more remotely from home and were positive about a green workplace (BloemenbureauHolland, 2021). Furthermore, people were obligated to stay at home, not able to do much, especially not going on vacation. Therefore people saved money, which was spend to redecorating the garden (NOS nieuws, 2021). People were demanding more and more floriculture goods but the supply side of the industry could not cope with this. The growing demand and the lagging supply led to higher substantial price increases.

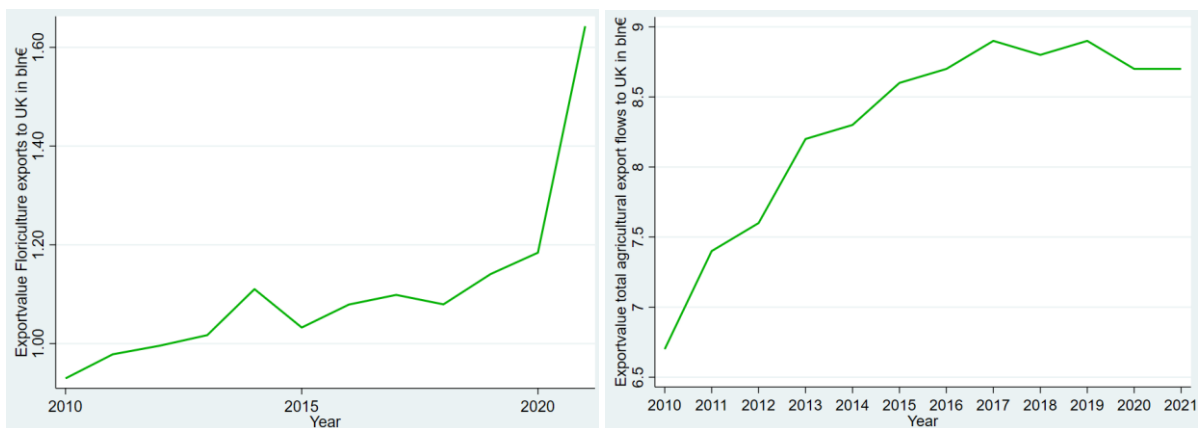


Figure 24 Trend floriculture exports to UK & Figure 25 Trend total agricultural exports to UK (Eurostat)

The question that rises is; is the aftermath of the COVID-19 pandemic the only explanation or is it also affected by the Brexit.

To asses this I used the counterfactual trend, which presents the UK trend if there would have been no Brexit in 2021. Figure 26 shows the UK trend line and the counterfactual trend line of the annual growth in periods 2011-2020 and 2020-2021. The figure shows a near parallel trend, which supports the parallel trend assumption descriptively. Furthermore it is visible that the floriculture export growth to the UK experienced the highest growth in 2021 of all the export destinations used in the analysis,

which explains the diverging trend lines post-Brexit. This might reject my expectations and could signify a positive Brexit effect on the floriculture export growth to the UK on top of the COVID-19 aftermath price increases.

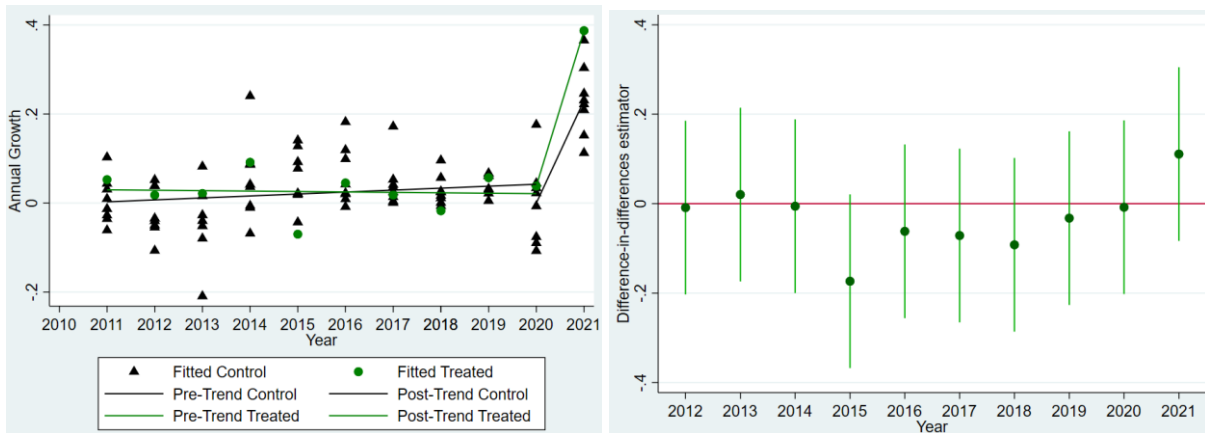


Figure 26 Annual growth floriculture 11-20 20-21 & Figure 27 Visual D-I-D Regression effects floriculture (Eurostat)

These findings can be tested statistically with the regression output of Stata in table 9. Starting with the parallel trends assumption test, we see that almost all the years in the pre-Brexit period have a P-value of 0.35. Only in 2015 we see a small P value of 0.08, close to my significance level. Desk research and field research with some industry experts, including Berg and researchers at Wageningen University, did not provide any clear explanation for this difference.

Nevertheless, since the P-values are above the 5% significance level, I do not regret the null-hypothesis that the pre-Brexit trends are similar. Hence, the parallel trends assumption holds and the control group is a valid counterfactual.

Growth06	Coefficient	Std. err.	z	P> z	[95% conf. interval]
Treated#Year					
1 2012	-.0088601	.0990428	-0.09	0.929	-.2029804 .1852602
1 2013	.0202726	.0990428	0.20	0.838	-.1738478 .2143929
1 2014	-.0057018	.0990428	-0.06	0.954	-.1998221 .1884186
1 2015	-.1734302	.0990428	-1.75	0.080	-.3675505 .0206901
1 2016	-.061876	.0990428	-0.62	0.532	-.2559963 .1322443
1 2017	-.0712682	.0990428	-0.72	0.472	-.2653885 .1228521
1 2018	-.0919921	.0990428	-0.93	0.353	-.2861124 .1021282
1 2019	-.0324149	.0990428	-0.33	0.743	-.2265352 .1617054
1 2020	-.0079757	.0990428	-0.08	0.936	-.202096 .1861446
1 2021	.1108401	.0990428	1.12	0.263	-.0832802 .3049604

Table 9 STATA reession output floriculture exports

Looking at the results post-Brexit, it can be seen that 2021 has a positive estimate of 0.11 and a P-value of 0.263. The positive difference is most likely because of the UK tradition to be very occupied with flowers and plants (Vijverberg, 2022), or gardening as they call it themselves (MerlinVenue, 2017), together with the 90% share of the Netherlands as origin of total floriculture imports in the UK (Berg,

2022). Despite the effect of 11%, I cannot reject the null-hypothesis that the Brexit effect is equal to zero, since the P-value is above the 5% significance level. Hence, I conclude that the definite Brexit, with phase one of the new regulations and formalities, did not have a significant effect on annual growth values of Dutch floriculture exports to the UK.

In 2016, the self-sufficiency rate of flowers, was only 10% in the UK, according to ABN Amro (2017). The domestic production of flowers and plants, which are the main floriculture imports from the Netherlands, is increasing, with a growth of 16% in 2021 (Department for Environment Food & Rural affairs, 2022). However, Royal FloraHolland’s expert Eline van den Berg (2022) sees little chance that the UK will try to specialize even more to become self-sufficient in the floriculture industry and thereby reducing Dutch imports.

The settlement of 0% import tariffs on flowers in the trade agreements between the UK and countries like Colombia, Ecuador and Kenia (Middelburg, 2020) results in a different opinion. ‘With Kenia as an important country of origin for flowers, I do see a potential threat for the Dutch floriculture exports to the UK in these developments. However, recent numbers do not provide any evidence of a shift’ (Berg, 2022). The flower imports from Kenia and Colombia to the UK experienced a greater export value growth in relative terms, 133% and 62% respectively, than the imports from the Netherlands, 30%. In absolute terms, however, the Netherlands is still number one with an increase of €160m in export value, compared to Kenia and Colombia who experienced a growth of €75m and €21m in export value respectively (Boon J. , 2021). It might be interesting to see how these numbers develop in 2022, since many floriculture hauliers already experienced a decrease of 30 to 40% in exports to the UK, compared to the first half year of 2021 (Vijverberg, 2022).

Vegetables

The Dutch export value of vegetables, CN07, to the UK has quite a stable trend line since 2016, similar to the total export values of all agricultural product groups, see figure 28 and 29. However, we do see a small decrease in export value in the years of the pandemic and Brexit disruptions.



Figure 28 Trend vegetables exports to UK & Figure 29 Trend total agricultural exports to UK (Eurostat)

These first findings are signals that do not support my hypothesis. To assess this I used the counterfactual trend, which presents the UK trend if there would have been no Brexit in 2021. Figure 30 shows the UK trend line and the counterfactual trend line of the annual growth in periods 2011-2020 and 2020-2021. The figure shows a near parallel trend pre-Brexit, which supports the parallel trend assumption descriptively. Furthermore, it is visible that the vegetables export growth to the UK experienced the smallest growth in 2021, just below 0%, of all the export destinations used in the analysis, which explains the diverging trend lines post-Brexit. The difference is not substantial, but might reject my expectations and could signify a negative Brexit effect on the vegetables export growth to the UK.

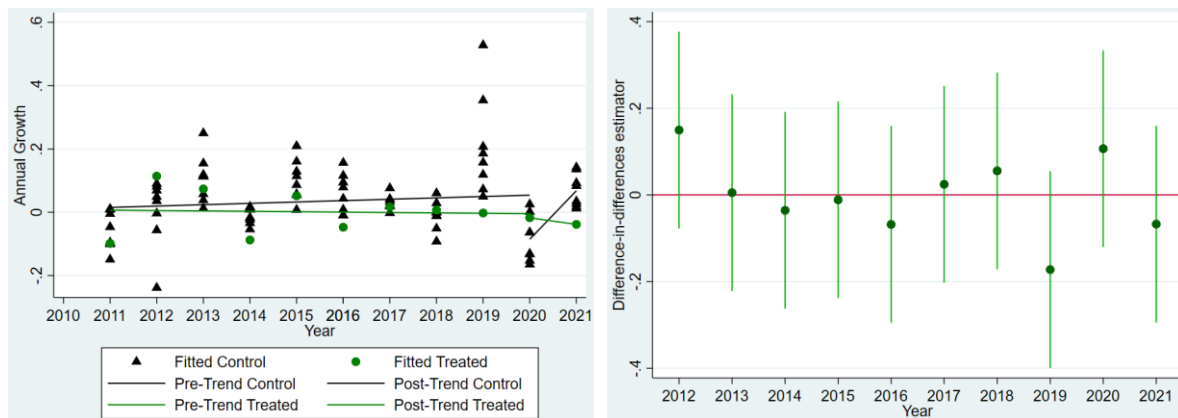


Figure 30 Annual growth vegetables 11-20 20-21 & Figure 31 Visual D-I-D Regression effects vegetables (Eurostat)

These findings can be tested statistically with the regression output of Stata in table 10. Starting with the parallel trends assumption test, we see that all the years in the pre-Brexit period have a P-value above 0.10. Since the P-values are above the 5% significance level, I do not reject the null-hypothesis that the pre-Brexit trends are similar. Hence, the parallel trends assumption holds and the control group is a valid counterfactual.

Growth07	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
Treated#Year						
1 2012	.1497003	.1158459	1.29	0.196	-.0773535	.3767541
1 2013	.0051734	.1158459	0.04	0.964	-.2218804	.2322272
1 2014	-.0354935	.1158459	-0.31	0.759	-.2625473	.1915603
1 2015	-.0112918	.1158459	-0.10	0.922	-.2383456	.215762
1 2016	-.0680944	.1158459	-0.59	0.557	-.2951482	.1589594
1 2017	.0245028	.1158459	0.21	0.832	-.202551	.2515566
1 2018	.0555775	.1158459	0.48	0.631	-.1714763	.2826313
1 2019	-.1724069	.1158459	-1.49	0.137	-.3994607	.0546469
1 2020	.1067087	.1158459	0.92	0.357	-.1203451	.3337625
1 2021	-.0673386	.1158459	-0.58	0.561	-.2943924	.1597152

Table 10 STATA rearsion output veaetables exports

Looking at the results post-Brexit, it can be seen that 2021 has a negative estimate of 0.067 and a P-value of 0.561. I cannot reject the null-hypothesis that the Brexit effect is equal to zero, since the P-

value is far above the 5% significance level. Hence, I conclude that the definite Brexit, with phase one of the new regulations and formalities, did not have a significant effect on the annual growth of Dutch vegetables exports to the UK. This is visually presented in figure 31. In this figure we see the greatest difference in 2019, where the exports to the UK remained quite constant but the exports to the other countries experienced a growth. According to Jan Kees Boon (2022), initiator of Fruitandvegetablefacts.com, there is no particular explanation for this difference. ‘Until 2020 the trade with the UK did not experience any Brexit related issues, only from 2021 the administrative hassle started. Despite that there were some barriers, the exports of vegetables to the UK went pretty well’.

In the five years post-Brexit referendum, see figure 32, the self-sufficiency rate of vegetables barely increased to 57% in 2021. But UK’s areas for vegetable production were reduced by 5% (Department for Environment Food & Rural affairs, 2022). Tomatoes, as leading Dutch export product (Groenten Fruit Huis, 2022), only had a 15% self-sufficiency rate in 2020 (Boon J. K., 2021). Considering the small growth values and the high dependency on Dutch top export products, it is also not likely that the self-sufficiency rate of vegetables will increase substantially and thereby harm the Dutch exports to the UK. Vijverberg confirms this by saying ‘Most likely, the UK will retain its position as importing country of Dutch vegetables. In 2022 the Dutch exports of vegetables to the UK have been experiencing a good year so far’ (Vijverberg, 2022).

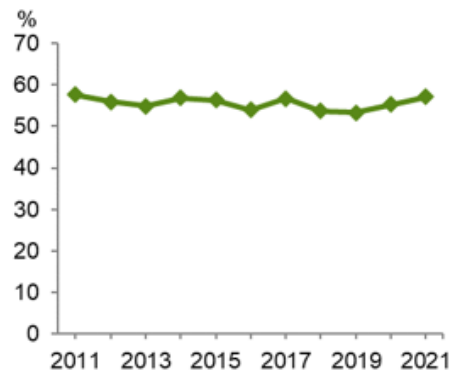


Figure 32 Self-sufficiency UK vegetables (Department for Environment Food & Rural affairs, 2022)

Trade agreements between the EU and other extra-EU countries might be a potential threat for the Dutch export of vegetables to the UK. Since June 1st 2022, the UK and Morocco have agreed on a lowered tariff preference rate of 5.7% for the bilateral trade of tomatoes, where the tariff rate for the trade of tomatoes between the UK and third countries is 14% (UK government, 2022). RedStar already decided to export less tomatoes to the UK and see Morocco winning market share with direct exports to the UK. This decision is, however, for a large share based on another aspect. ‘Due to the increasing gas-prices in the Netherlands it becomes less interesting to grow tomatoes. At some point in time, our cost price exceeded our sales price. This, in combination with the Brexit related logistical bottlenecks and corresponding fines, made us decide to cut in tomato exports to the UK. Right now, we see a shift towards the Moroccan growers as direct channel’ (Waard, 2022). Three developments that strengthen each other as threats for the Dutch exports of vegetables to the UK. The problem of increasing gas prices harms the whole horticulture industry in the Netherlands substantially (HortiDaily, 2022), but this development will be let out for further discussion since it is not in scope of this research.

Fruit

Looking at figures 33 and 34, we see that the Dutch export value of fruit, CN08, to the UK experienced quite a similar trend line as the total agricultural export values until 2016, or in other words pre-Brexit referendum.

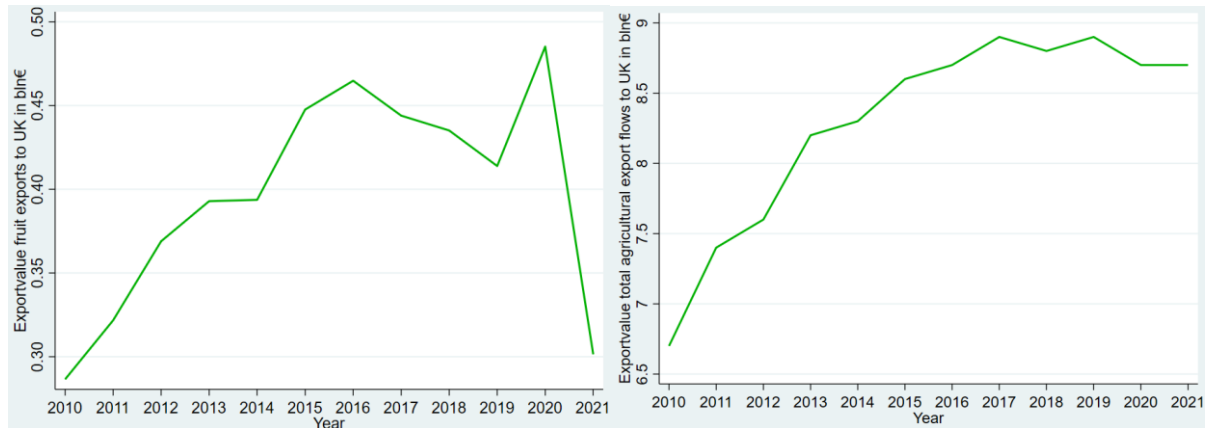


Figure 33 Trend fruit exports to UK & Figure 34 Trend total agricultural exports to UK (Eurostat)

Post-Brexit referendum, fruit export experienced a strong decrease, except for the growth in 2020.

This growth in 2020 is most likely caused by the fact that the British people consumed the highest amount of fruit on average and increased their consumption substantially during the COVID-19 crisis, see figure 35 (Kantar, 2020).

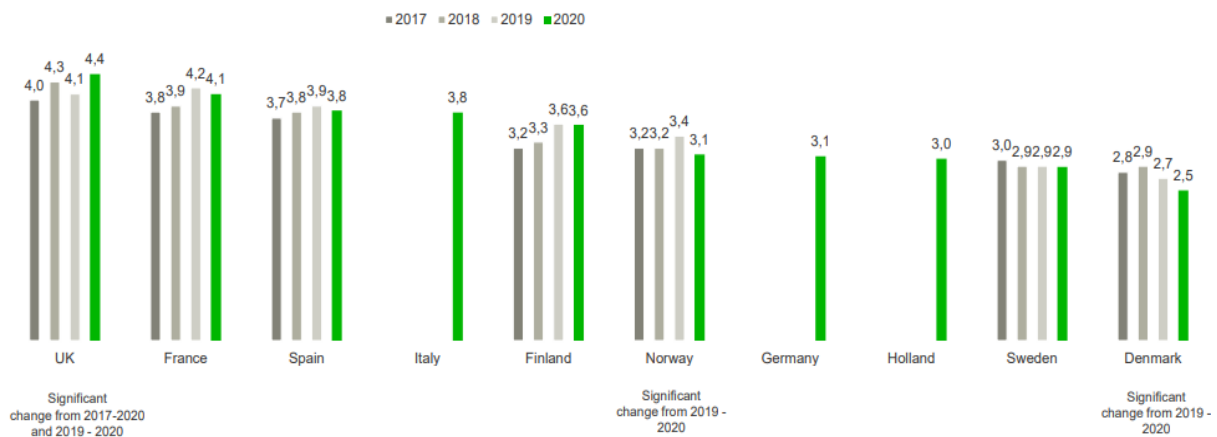


Figure 35 Development 2017-2020: Mean of daily consumption of fruit and vegetables (Kantar, 2020)

On the other hand, the substantial share of re-exports in total Dutch fruit exports is expected to make the export values vulnerable for the Brexit. This expectation is supported by figure 33, where we see a strong decrease in the export value post-Brexit. These first findings are signals that do support my hypothesis. To assess this I used the counterfactual trend, which presents the UK trend if there would have been no Brexit in 2021. Figure 36 shows the UK trend line and the counterfactual trend line of the annual growth in periods 2011-2020 and 2020-2021. The figure shows a questionable parallel trend, which makes the descriptive interpretation of the parallel trend assumption somewhat ambiguous. Just like the decreasing export value we saw in figure 33, we now see the trend lines diverge from 2016 onwards, post-Brexit referendum.

Furthermore it is visible that the fruit export growth to the UK in 2021 is far below the fruit export growth values of the counterfactual countries, near -40%, which explains the diverging trend lines post-Brexit. This might support my expectations and could signify a negative Brexit effect on the fruit export growth to the UK.

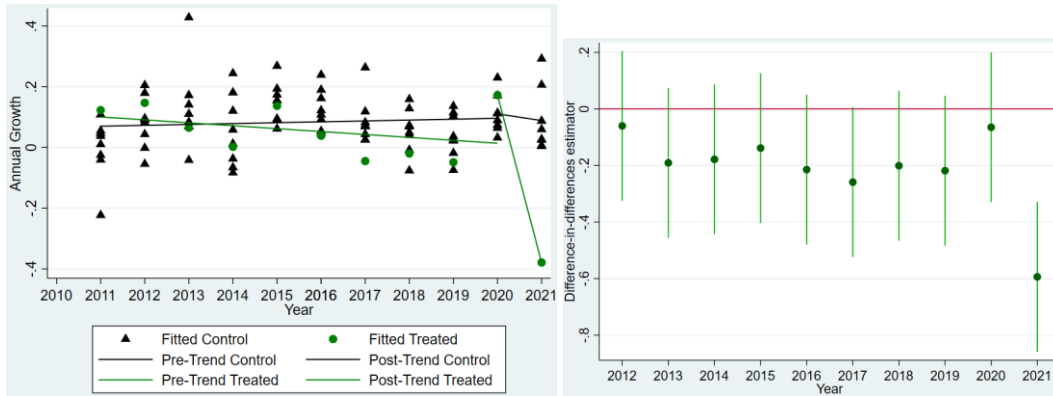


Figure 36 Annual growth fruit 11-20 20-21 & Figure 37 Visual D-I-D Regression effects fruit (Eurostat)

These findings can be tested statistically with the regression output of Stata in table 11. Starting with the parallel trends assumption test, since the P-values pre-Brexit are above the 5% significance level, I do not regret the null-hypothesis that the pre-Brexit trends are similar. Hence, the parallel trends assumption holds and the control group is a valid counterfactual.

Growth08	Coefficient	Std. err.	z	P> z	[95% conf. interval]
Treated#Year					
1 2012	-.0600144	.135197	-0.44	0.657	-.3249956 .2049669
1 2013	-.1906845	.135197	-1.41	0.158	-.4556657 .0742967
1 2014	-.1783868	.135197	-1.32	0.187	-.443368 .0865944
1 2015	-.1385566	.135197	-1.02	0.305	-.4035378 .1264247
1 2016	-.2147091	.135197	-1.59	0.112	-.4796903 .0502721
1 2017	-.2590117	.135197	-1.92	0.055	-.523993 .0059695
1 2018	-.2008996	.135197	-1.49	0.137	-.4658808 .0640816
1 2019	-.2185147	.135197	-1.62	0.106	-.4834959 .0464665
1 2020	-.0649609	.135197	-0.48	0.631	-.3299421 .2000203
1 2021	-.593889	.135197	-4.39	0.000	-.8588702 -.3289078

Table 11 STATA regression output fruit exports

The results in table 11 and figure 37 post-Brexit provide a clear image for the Brexit effect. It can be seen that 2021 has a negative estimate of 0.594 and a P-value of 0.000. Hence I conclude that the definite Brexit, with phase one of the new regulations and formalities, had a negative effect on the annual growth of Dutch fruit exports to the UK of 59.4%. Since the P-value is only 0.000 I do reject the null-hypothesis and conclude that there is enough evidence that this effect is significant at a 5% significance level.

In the five years post-Brexit referendum, see figure 38, the self-sufficiency rate for fruit barely changed towards the 15% in 2021, and UK's areas for fruit production experienced a slight reduction (Department for Environment Food & Rural affairs, 2022).

Considering the small growth value, it is not likely that the self-sufficiency rate of fruit will increase substantially in terms of production. However, the UK has already improved in trade self-sufficiency by directly importing extra-EU goods in-stead of using the Netherlands as re-exporting or quasi-transit hub for those goods. As table 11 shows, this already had a significant effect on Dutch fruit exports in 2021.

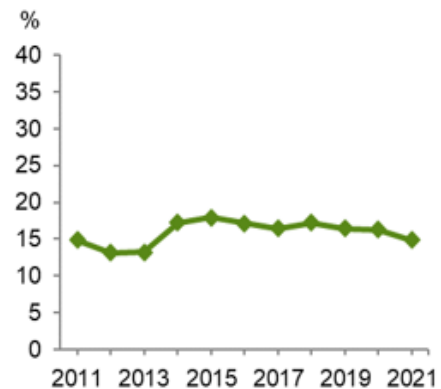


Figure 38 Self-sufficiency UK fruit (Department for Environment Food & Rural affairs, 2022)

As discussed in previous paragraphs, re-exports and quasi-transit flows are expected to be vulnerable for the new or extended and liberalised trade agreements between the UK and extra-EU countries. The great share of re-exports in total Dutch fruit exports makes the export of this product group to the UK also vulnerable for this development. This is also expected by the interviewed industry experts; 'in 2021 we have already seen a substantial decrease in fruit exports to the UK and this trend is continuing in 2022. The development of trade agreements will only make this worse' (Vijverberg, 2022).

Throughput port of Rotterdam

First, let me recall my hypothesis regarding the effect of the Brexit on the throughput volumes in the port of Rotterdam.

The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the port of Rotterdam's agricultural throughput to the UK in 2021.

My expectation of a negative effect of the Brexit on the throughput to the UK was also expected by the port authority, Port of Rotterdam. Mark Dijk, Manager External Affairs at Port of Rotterdam, announced an expected loss of 30 to 40% of the trade flows to the UK via the port of Rotterdam due to the additional import tariffs. Besides this reduction in trade flows it was expected that on the short term, several administrative and logistical problems would arise (Dijk, 2019). More of the latter in a later paragraph.

In previous paragraphs I discussed the substantial and significant reductions in Dutch re-exports and quasi-transit flows. These flows are less important for the Netherlands in terms of net income, compared to domestically produced exports, but are at least of equal importance for the port of

Rotterdam. Figure 39 shows the percentages of all EU- and extra-EU imports to the UK over the last five years. There is already a shift observable in 2021. This is in line with the decreased re-exports and since the port of Rotterdam is such an important transport and logistical hub it affects also the throughput of the port, which supports my hypothesis.

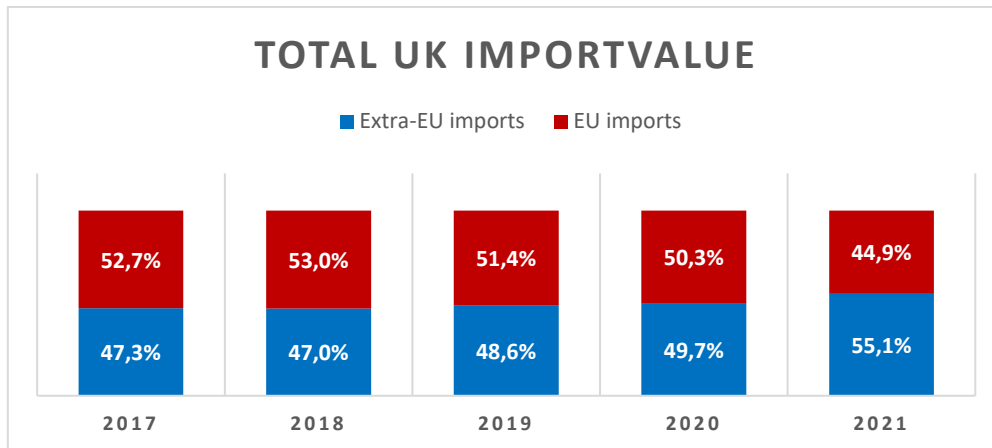


Figure 39 UK EU and extra-EU imports 2017-2021 (UK Government, 2022)

However, there are multiple transit flows going through the Netherlands, via the Port of Rotterdam which are not accounted as Dutch exports but do add to the business activities in the port. The port of Rotterdam is also an import hub for true transit- or entrepot transit flows by combining many intercontinental deep-sea connections with several feeder or short sea connections throughout Europe or deep-sea connections with other continents, as we can see in figure 40 (Port of Rotterdam, n.b.).



Figure 40 Global deep-sea, feeder and short-sea connections port of Rotterdam (Port of Rotterdam, n.b.)

Maurits van Schuylenburg, Program Manager Business & Accounts at Port of Rotterdam, says the following: ‘We all expected substantial reductions in the throughput volumes to the UK, since direct extra-EU imports were more likely. However, the big container terminals in Felixstowe and Southampton experienced major issues regarding congestion. As better performing container port we saw an increase in transshipment volumes from deep-sea to feeder or short sea vessels to the UK’

(Schuylenburg, 2022). For the latter statement I received some transshipment data. The green line in figure 41 shows increasing transshipment volumes to UK/Ireland in 2021, whereas the blue and red lines show decreasing transshipment volumes for the Scandinavian/Baltic countries and the Iberian/Mediterranean countries respectively.

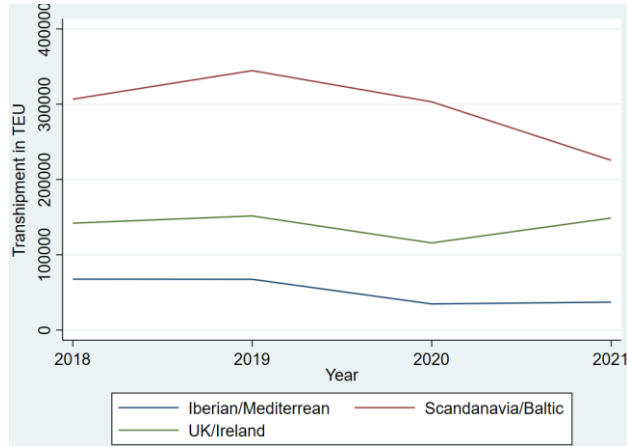


Figure 41 Port of Rotterdam deep-sea to feeder transshipment volumes 2021 (Schuylenburg, 2022)

Also for the general RORO transport numbers, where the share of agricultural freight in total freight is expected to be higher because of the production and exporting sites in the larger port environment, we see an increase of throughput to the UK in 2021 of 12% compared to 2020 and 2.5% compared to 2019.

Unfortunately there is no specific agriculture data available for all the trade flows through the port of Rotterdam. I do not think, however, that the developments for the current agricultural transit flows will look substantially different than what we see in figure 41. Because, if we compare the trend line of global trade for agricultural goods with the trend line of global trade for all goods, see figure 42 and 43 respectively, we see quite a similar pattern, except for 2020 during the COVID19 pandemic.

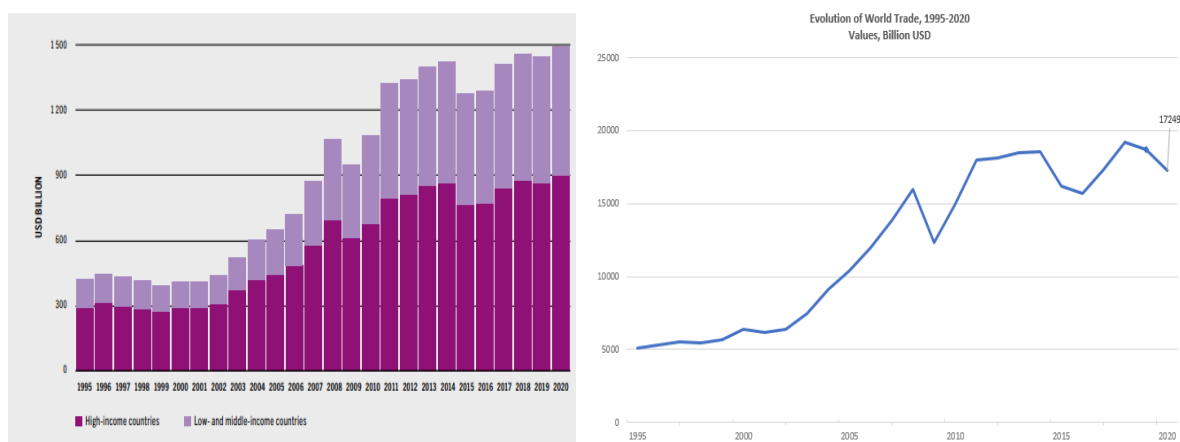


Figure 42 Global agricultural trade 95-20 (FAO, 2022) & Figure 43 Global trade 95-20 (WTO, n.d.)

I can conclude that the effect of the Brexit on the port of Rotterdam's throughput volumes after one year is somewhat ambiguous. However, the developments discussed before might play a role in the discussion for the coming years. 'The UK is working actively on trade agreements with extra-EU countries, which makes it more interesting to shift imports via the Netherlands and the port of Rotterdam to direct imports from those extra-EU countries. The only thing is that the container ports in the UK are not that well organized and facilitated as the ports in Rotterdam or Antwerp. If they will optimize these container ports, which is just a matter of time, than we will most likely lose large shares of the trade flows to the UK' (Bruggen, 2022). I asked Schuylenburg about his view on these developments and this confirms the view of Bruggen: 'If the UK succeeds to expand their container ports and organize them in a good way, than we might see our transshipment volumes to the UK reduce substantially. If they succeed, and only if, than the free trade agreements between the UK and extra-EU countries might strengthen the effect. But, they will only win volumes to their own market, not for the rest of Europe' (Schuylenburg, 2022).

Furthermore I asked Schuylenburg about his opinion about the developments of eased Emission tonnage schemes in UK ports and the settlement of freeports. 'There are still no changes in the UK's tonnage tax schemes after one and a half year. Furthermore, we do not see freeports as a competitive aspect. We have similar setups in the port of Rotterdam, maybe it could be profitable for their own trade flows' (Schuylenburg, 2022). The latter development of freeports is not likely to affect agricultural businesses at all, since these policies are more likely to benefit manufacturing businesses (Mielken, 2021).

Competitive edge

The Dutch agricultural exports to the UK experienced a small growth of €30m, or 0.34%. As I announced in the literature review, I do not agree with the Wageningen University and CBS that in 2021 the Netherlands was the second most important origin of the UK's agricultural imports (Jukema, Ramaekers, & Berkhout, 2022). With the data I retrieved from Eurostat, see analysis in appendix VIII, we still see that Netherlands is the most important origin for UK's agricultural imports with €8.7b export value, followed by Ireland with €6.0b export value and thereafter France with €5.6b export value. The latter two switched places after Brexit.

The Dutch exports to UK, as I have already discussed before, experienced the largest decrease in the exports of Fruit. Only Italy, Poland and France saw a slight increase in their fruit exports to the UK in 2021. The second largest decrease for the Netherlands was the export of fish and seafood, but also for this product group there was no other EU country who saw their UK exports increase substantially. The largest growth values were experienced in the product groups floriculture and drinks.

Germany experienced the worst growth of agricultural exports to the UK with a loss of €812m in export value. The German exports to the UK experienced losses in nearly all product groups. Belgium experienced the largest growth of agricultural exports to the UK with an increase of €776m in export value, almost a 23% growth in relative terms. Their most substantial increases were in drinks, preparations of cereals, floor and milk, preparations of meat and fish and dairy and eggs. Especially on this latter product group they have won competitive edge over the Dutch exports to the UK. Despite some desk research and field research, I could not find a particular cause for this development.

Qualitative results

In this paragraph I discuss the qualitative results of the interviews regarding the Brexit related bottlenecks, loss in flexibility, the persisting problems in the market, the UK market as specialization and supply chain collaboration, all divided in subsections.

Bottlenecks

The new Brexit related regulations and formalities made firms to adjust their business processes. This caused for bottlenecks in the administrative and logistics processes, where the first resulted in the second. Since the Brexit, all order details for export freight to the UK need to be shared with supply chain parties like the Dutch community system Portbase, carriers, external hauliers and customs declarants. 'Processing an export order with the right details went from 2 to 30 or 40 minutes' (Dokman, 2022). A well-known problem with the documents was, and still is, the interpretation of the requested input fields which causes confusion and can therefore result in incorrect documents (Bruggen, 2022). At the terminals in Rotterdam they experienced these problems with incorrect documents or incorrect data input which resulted in delays or freight refusals (Westerholt, 2022).

These bottlenecks were already expected in advance. Therefore, Port of Rotterdam, in collaboration with customs and ferry carriers have made a lot of effort to prepare as good as possible for the expected congestion at the terminals. For example, huge investments were made for implementing emergency parking places to take care of rejected trucks. Expectations were that hauliers and exporters from eastern European countries would be less prepared and therefore cause more trouble at the terminals (Schuylenburg, 2022). However, as the industry experts acknowledge, the export side of the transport went surprisingly smooth in general.

Most problems in the first phase were experienced on the import side in the UK, where hauliers faced hours of waiting times due to resource problems and other unfamiliarities at UK terminals (Alphen, 2022). Due to the logistical problems and corresponding fines from customers, firms had to expand their same night, or A-B, deliveries to A-C deliveries, where goods are delivered two days after the

order is placed (Waard, 2022). Freight Line Europe was one of the first hauliers who decided to go back to the A-B deliveries to push it to the limits for their customers and gain competitive edge, which was not appreciated by every party in the industry (Vijverberg, 2022).

The second phase of Brexit regulations, which started on January 1st 2022, was more challenging for logistics service provider Freight Line Europe. 'Where last year, the customs clearance could be delayed for six months, it is now required to get this done before exporting the goods. Clients did not experience any changes in processes, but our methods had to change drastically due to the new regulations. This took some time to adjust, which resulted in more delays for trucks at the border than last year' (Vijverberg, 2022). The interviewed experts, however, are in general not afraid for the third phase of regulations which are postponed till, at least, the end of 2023. 'The Dutch industry was already well-prepared for the change. Together with, among others, KCB (Kwaliteits-Controle-Bureau) and NVWA (Nederlandse Voedsel- en WarenAutoriteit) we started arranging programs for firms to train their quality managers or inspectors for phyto certification, but also for the general KCB certification (Sol, 2022). Delegating these inspections to the firms covers the shortages of KCB inspectors (Berg, 2022). But it works both ways, the industry experts see it as a way to save time and money. Inspections can be done whenever it suits and performing it by yourself is less costly than the KCB. The remaining question will be; Is the UK side ready?

Flexibility

The agricultural supply chains lost flexibility due to Brexit and this will worsen even more with the announced regulations at the end of 2023. 'Just-in-time is over for the UK market, we are going back to old-fashioned methods' (Alphen, 2022). It became harder for exporters to make it to the appointed deadlines because of the inspections, acknowledged by exporter T.O.F.F. BV (Dokman, 2022) and their logistics service provider Freight line Europe (Vijverberg, 2022). Vijverberg sees the greatest issues for logistics service providers or hauliers in bundled transports to the UK, 'In the past we were able to change our truck planning till departure. Since the Brexit we cannot make any changes after registering our transport in Portbase and the portals of the ferry carriers. When partial freights are cancelled after registration, we are not allowed anymore to fill up the gaps. This loss in flexibility therefore also harms our efficiency (Vijverberg, 2022).

Persisting problems

The interviewed experts see several issues in the industry which are expected to persist or even worsen in the coming years. The supply chain is dependent on well-working IT systems, which we have in the Netherlands. The IT systems on the other side of the North-Sea, however, are not that impressive. Alphen (2022) sees this, in combination with personnel shortages for office jobs, customs and truck drivers, as the main operational issues that will persist on UK side. He also thinks that UK policy making

harms Dutch firms in tactical and strategic decision making; 'The difficult policy making and inconsistent decisions on UK side is bad for Dutch transport and trade. Firms have to formulate strategies and investment plans for the long term, which is not possible due to all the uncertainties'. Westerholt (2022) emphasizes on the issue of personnel shortages for truck drivers; 'Due to the increasing shortages in truck drivers, on both sides, the supply chain will become more vulnerable. I am curious if firms dare to make the shift to more unaccompanied RORO transport on the ferries'

Specialization

The most salient Brexit development that was evident from the interviews is the UK market as a specialization. Due to knowledge, experience, reach and volumes it was easier for larger and well-prepared firms to continue with trade and exports to the UK. In the re-export paragraph of this chapter I already discussed the situation of Verdi Import, who stopped their UK business due to import tariffs. This trend is also acknowledged by Westerholt (2022), who claims that smaller hauliers completely stopped their UK businesses due to new regulations. Alphen (2022) explains the motivation of DIJCO as haulier to stop temporarily with transporting to the UK and his view on a specialized UK market. 'At DIJCO we were worried about the Brexit. As haulier we did not have the right knowledge and experience to continue with all our business to the UK. All our bundled transports were outsourced to the Freight Line Europe. It was almost one year after Brexit when we started again by slow stages. The UK market is shrinking and most likely the smaller firms will lose their UK activities to the larger and specialized exporters and transporters because of knowledge, experience and higher administrative costs'.

Seeing Brexit as an opportunity instead of a threat appears to be key in gaining market share. Vijverberg (2022) explains; 'Exporters, hauliers and logistics service providers who put time and effort in preparing their employees and business activities to the Brexit, are now reaping the benefits'. Dokman (2022) confirms this by saying; 'Customers could reduce the prices by placing their orders at one exporter. As we were well prepared for the Brexit, we had a competitive edge above the competitors which resulted in an increase in export volumes'. This development in the agricultural export market to the UK is acknowledged by all the interviewed industry experts.

Supply chain collaboration

A positive development of the Brexit in the agricultural industry, and most likely all industries, is the collaboration in the supply chains. 'A chain is as strong as its weakest link', and therefore it was of great importance that all actors were thoroughly informed and deeply involved. All industry experts interviewed acknowledged this. Bruggen (2022) emphasizes the importance of the supply chain collaboration in this period; 'Customs, KCB, NVWA, GroentenFruit Huis, carriers, even competitive

firms worked together for the sake of the competitive position of the Netherlands as (re-)exporter and Rotterdam as transit hub'. Vijverberg (2022) sees the Brexit related supply chain collaboration as a potential breakthrough in logistics; 'Collaboration at this level is not common in logistics. Due to the Brexit we were forced to work together, but because of that we have noticed that we can learn a lot from each other by having different ways of looking at things'.

Discussion

In this thesis I conducted a research to the effect of the Brexit on Dutch trade flows to the UK and corresponding logistics hotspots in South-Holland region. I did this by testing six research hypotheses, based on existing literature.

H1; The growing Brexit probability and EU-UK trade agreement uncertainties in pre-Brexit years had a negative effect on the Dutch agricultural trade flows to the UK. This hypothesis was based on a research by Graziano and co-authors (2018) who estimated an impact on EU-UK trade which was twice as high than the impact on UK-EU trade. The estimated negative, but insignificant, effect does not perse go against the existing literature.

H2; The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had no effect on the Dutch agricultural domestically produced export flows to the UK in 2021. This hypothesis is based on the statement that the first phase of Brexit regulations in 2021 was not expected to have much impact on the domestically produced exports. The estimated negligible and insignificant effect supported these expectations.

H3 The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the Dutch agricultural re-export flows to the UK in 2021. H4; The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the Dutch agricultural quasi-transit flows to the UK in 2021. Both hypotheses were based on the implemented import tariffs on extra-EU originated goods. The estimated negative Brexit effects on the annual growth values of both trade flows, are in line with the expectations.

H5; The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a mixed effect on the export flows of Greenport West-Holland clusters' specialized product groups to the UK in 2021, with a negative effect for fruit and no effect for vegetables and floriculture. The positive, but insignificant, estimate for floriculture, the negative, but

insignificant, estimate for vegetables and the significant negative effect of 59.4% for fruit were completely in line with my expectations.

Hypothesis 2,3,4 and 5 were mainly based on the first Brexit results in the annual publication of Wageningen University and CBS (2022), which are not contradicted by the results of my research. Other researches in my literature review provided expected Brexit effects on Dutch GDP, agricultural-production and trade to the UK, but did not make the distinction between different trade flows by estimating the expected results. My results show once more, that Lankhuizen and Thissen (2019), and Lemmers and Wong (2019), were right about the importance of the distinction between the several trade flows while estimating the effect of the Brexit, especially in the Netherlands.

H6; The definite Brexit on January 1st 2021, with the start of phase one of the new Trade and Cooperation Agreement regulations, had a negative effect on the port of Rotterdam's agricultural throughput to the UK in 2021. The ambiguous current results are against my expectations and current literature, which were based on the expected decreases in re-exports and quasi-transit flows, neglecting the other transit flows through the port of Rotterdam. This once again shows the importance to include all trade flows in such an analysis, especially for the Netherlands and the port of Rotterdam as important transport and logistics hubs in global supply chains.

Furthermore, there were some qualitative results which were aligned with previous literature. My findings confirm the expected Brexit bottlenecks which were discussed in the paper of Berkum and co-authors (2018). The results in the paragraph *specialization* acknowledge the need of Supply Chain Resilience, discussed by Hendry and co-authors (2018). And finally the Brexit development of free trade agreements between the UK and extra-EU countries is seen as a potential threat for several trade flows to the UK by the industry experts. However, just like Garcia-Herrero and Xu (2016) discuss in their paper, they emphasize that it will not harm the Dutch trade flows to destinations in the EU.

The few results in the annual publication of Wageningen University and CBS gave a good first understanding and basis of what happened in the industry post-Brexit. My research goes more in depth by using a counterfactual trend to replicate a 'what if there was no Brexit' scenario, provides more specific insights for the logistical hotspots in the South-Holland region and combines quantitative results with qualitative results from interviews to obtain a better interpretation.

Despite the strengths of my research, I also see some limitations. As discussed before, constructing a more closely matched control group by matching a subset of the overall control group to the treated group may result in less bias, but it also decreases the amount observations. Less observations may be the cause of the wide confidence intervals in my quantitative analyses, which may result in null-

hypotheses to be rejected less often. Another limitation of the data is for the distinction between re-exports and domestically produced exports, which are only available from 2018 onwards. It would be interesting to divide the uncertainty effects over the different trade flows for the post-Brexit referendum years. Third, and last, limitation is that I only have data available until 2021, first year post-Brexit. The real Brexit effect will be more evident after a couple of years, when the full transition period is over and supply chains are adjusted.

This latter limitation is also one of my recommendations for future research. An annual research can detect the progress of several developments. What will the regulations of 2022 have for effect on Dutch agricultural trade flows to the UK? What will the regulations at the end of 2023 have for effect on Dutch agricultural trade flows to the UK? How will the self-sufficiency in the UK develop after a couple of years, and how does it affect the Dutch agricultural trade flows to the UK? These are all interesting questions to be answered in the next couple of years. Another recommendation is to maintain and scale-up the Brexit-related collaboration in the industry's and wider supply chains. Recently we have had the COVID-19 pandemic, right now we are experiencing the war in Ukraine and its side effects, rising gas prices and inflation in general, labor supply shortages in every industry, and last but not least the 2040 climate goals which must be met. Supply chain collaboration is still not yet the most common thing in logistics and transport, but to cope with the challenges we have to make that switch.

Conclusion

What is the effect of the Brexit on Dutch agricultural trade flows to the UK and its corresponding logistics activities in the port of Rotterdam and the larger port environment?

To answer this question I used a mixed research method. With the data of the annual publications of Wageningen University and CBS and the databases of Eurostat, I performed a quantitative difference-in-differences analyses to estimate the difference between the actual values and the counterfactual values in case that there would have been no Brexit. As a qualitative tool I used interviews with industry experts to give my quantitative results a better interpretation and to provide additional non-quantifiable insights.

For the annual growth values of total Dutch agricultural trade flows to the UK, which includes domestically produced exports, re-exports and quasi transit flows, I have estimated an insignificant effect of the growing Brexit probability and EU-UK trade agreement uncertainties in post-Brexit referendum years. We saw, however, a negative and significant Brexit effect in 2021.

For the annual growth value of Dutch domestically produced agricultural exports to the UK I have estimated a negligible and insignificant effect of the Brexit in 2021.

For the annual growth value of Dutch agricultural re-exports to the UK I have estimated a negative and significant Brexit effect in 2021 of 43.2% due to implemented import tariffs for extra-EU originated goods. The same regulation resulted in a negative Brexit effect in 2021 of 123.6% on the annual growth value of Dutch agricultural quasi transit flows to the UK. The negative effect is also observed when we look at the increased shares of direct extra-EU imports in the UK, compared to the share of EU imports. Industry experts also see a shift from quasi-transit flows towards Dutch transito- and entrepot-transit flows to the UK to avoid the extra import tariffs.

For Greenport West-Holland clusters' specialized product groups, I have estimated a positive but insignificant Brexit effect for the annual growth values of Dutch floriculture exports to the UK, a negative but insignificant Brexit effect on the annual growth values of Dutch vegetables exports to the UK and a negative and significant Brexit effect of 59.4% of the annual growth value of Dutch fruit exports to the UK in 2021.

The final test, for the Brexit effect on the agricultural throughput in the port of Rotterdam in 2021, resulted in some ambiguous findings. This is caused by the shift in trade flows, which are still often at some point connected to the port of Rotterdam.

One of the reasons of the Brexit for the UK was to become more self-sufficient in production and trade. Recent evidence shows that after one year of the definite Brexit, there has not been much improved, except for the direct imports from extra-EU countries which increased. UK's production is not expected to improve, but if they expand their ports in a well-facilitated and –organized way, than this can have substantial negative effects on the Dutch trade flows and port of Rotterdam's throughput volumes to the UK. However, it is not expected that the UK will win competitive edge on the Dutch trade flows to the countries on the European mainland. The success of the UK's port improvements will most likely also contribute to the success of the UK's trade agreements with extra-EU countries.

Other qualitative results derived from the interviews were increased administrative workload and increased administrative errors which lead to delays or refusals at the terminals. Furthermore we see losses in flexibility, both for exporters as for hauliers and logistics service providers. Industry experts see the IT systems and personnel shortages in the UK as persistent problems in the coming years, while also the UK government's policy-making and inconsistent decisions do not help the tactical and strategic decision making processes for Dutch firms in a positive way. The most salient Brexit development was that the UK as export market became a specialization. Supply chain actors with the right knowledge, experience, reach and volumes were more likely to continue their trade or business in the UK. Firms who saw the Brexit as an opportunity instead of a threat and changed their business activities accordingly, were able to gain competitive advantage and win market shares. The most promising Brexit-development that the industry experienced, was supply chain collaboration, not only vertical but also horizontal. Using this as breakthrough in transport and logistics can be of great importance to overcome all the challenges that we will face in the coming years.

References

- ABN Amro. (2017). *Brexit vanuit Brits voeselperspectief*.
- Alphen, E. v. (2022, June 27). Interview Brexit-Dutch agriculture DIJCO. (J. v. Wijdeven, Interviewer)
- Basu, P., & Small, D. S. (2020). *Constructing a More Closely Matched Control Group in a Difference-in-Differences Analysis: Its Effect on History Interacting with Group Bias*.
- Berg, E. v. (2022, June 30). The effect of Brexit on Agrofood - Greenport West-Holland. (J. v. Wijdeven, Interviewer)
- Berkum et al. (2018). *Exploring the impacts of two Brexit scenarios on Dutch agricultural trade flows*. Wageningen: Wageningen Economic Research.
- Berkum, S. v., & Terluin, I. (2016). *Brexit: Verkenning van de gevolgen voor de Nederlandse agrisector*. Wageningen: Lei Wageningen UR.
- BloemenbureauHolland. (2021, October n.d.). *Uitkomsten onderzoek planten op de (thuis)werkplek*. Opgehaald van BloemenBureauHolland: <https://www.bloemenbureauholland.nl/perskalender/uitkomsten-onderzoek-planten-op-de-thuiswerkplek>
- Boon, J. (2021). *FACTSHEET UNITED KINGDOM import cutflowers in 2021*.
- Boon, J. (2022). *FACTSHEET Verenigd Koninkrijk import verse groenten en fruit in 2021*.
- Boon, J. (2022, July 29). Vegetables export UK 2019. (J. v. Wijdeven, Interviewer)
- Boon, J. K. (2021). *FACTSHEET United Kingdom Fresh fruit and vegetables*.
- Bruggen, M. v. (2022, June 29). Interview Brexit-Dutch agriculture ABC Logistics. (J. v. Wijdeven, Interviewer)
- Bueno, G. (2022, February 11). *BRAZIL RESISTS TO ENHANCED TRADE PARTNERSHIP WITH THE UK*. Opgehaald van Murray: <https://murray.adv.br/en/brazil-resists-to-enhanced-trade-partnership-with-the-uk/#:~:text=The%20United%20Kingdom%20made%20a,resist%20taking%20these%20negotiations%20forward>.
- CBS. (2022, May 24). *Minder goederen, meer diensten naar het VK in 2021*. Opgehaald van cbs: <https://www.cbs.nl/nl-nl/nieuws/2022/21/minder-goederen-meer-diensten-naar-het-vk-in-2021>
- CBS. (n.d.). *Waarom verschillen de cijfers over de internationale goederenhandel van het CBS en die van Eurostat?* Opgeroepen op July 14, 2022, van CBS: <https://www.cbs.nl/nl-nl/faq/specifiek/waarom-verschillen-de-cijfers-over-de-internationale-goederenhandel-van-het-cbs-en-die-van-eurostat>
- Creemers et al. (2021). *Internationaliseringsmonitor, vierde kwartaal: Exogene schokken*.

- Department for Environment Food & Rural affairs. (2022, May 27). *Horticulture Statistics 2021*.
Opgehaald van floraldaily: <https://www.floraldaily.com/article/9305026/floriculture-sector-happy-with-uk-phytosanitary-rules-postponement/>
- DeStandaard. (2006, April 25). *Oost-Europese immigranten goed voor de Britse economie*. Opgehaald van m.standaard.be: <https://m.standaard.be/cnt/grprci12>
- Dijk, M. (2019). Havenbedrijf Rotterdam bereidt zich voor op Brexit.
- Dokman, D. (2022, June 28). Interview Brexit-Dutch agriculture T.O.F.F. BV. (J. v. Wijdeven, Interviewer)
- Douane Belastingdienst. (2020). *Top-40 meest gestelde vragen over Brexit en Douane*.
- Dunne, A. (2016). The role of Transit and Trans-shipment in counterproliferation efforts. *SIPRI Good Practice Guide*.
- Eiser, D., McEwen, N., & Roy, G. (2021). The Trade Policies of Brexit Britain: the Influence of and Impacts on the Devolved Nations. *European Review of International Studies*, 22-48.
- European Commission. (2021). *From the UK referendum to a new Trade and Cooperation Agreement*.
Opgeroepen op July 12, 2022
- European Commission. (2022). *The Combined Nomenclature*. Opgeroepen op July 7, 2022, van https://taxation-customs.ec.europa.eu/business/calculation-customs-duties/customs-tariff/combined-nomenclature_en
- eurostat. (2021). Opgeroepen op 01 31, 2022, van <https://ec.europa.eu/eurostat/web/nuts/background>
- Eurostat. (sd). Eurostat International Trade Database.
- FAO. (2022). *The State Of Agricultural Commodity Markets*.
- Garcia-Herrero, A., & Xu, J. (2016). What consequences would a post-Brexit China-UK trade deal have for the EU? *Bruegel Policy Contribution, No. 2016/18*.
- Graziano, A., Handley, K., & Limão, N. (2018). *BREXIT UNCERTAINTY AND TRADE DISINTEGRATION*.
- Greenport West-Holland. (2019). *Programma 2019-2025*.
- Greenport West-Holland. (2022, March 25). 'Segment agrofood blijft groeien bij Havenbedrijf Rotterdam'. Opgeroepen op July 11, 2022, van greenportwestholland: <https://greenportwestholland.nl/segment-agrofood-blijft-groeien-bij-havenbedrijf-rotterdam/>
- Groenten Fruit Huis. (2022). *Groenten en fruit in beeld jaarcijfers 2021*.
- GroentenFruit Huis. (2022). *Groenten en fruit in beeld jaarcijfers 2021*.

- Hendry et al, C. (2018). Local food supply chain resilience to constitutional change: the Brexit effect. *International Journal of Operations & Production Management*, 429-453.
- HM Government. (2022). *The Border with the European Union*.
- HortiDaily. (2022, February 15). *hortidaily*. Opgehaald van The Netherlands: Natural gas - why are the costs increasing so much: <https://www.hortidaily.com/article/9397550/the-netherlands-natural-gas-why-are-the-costs-increasing-so-much/>
- House of Commons Environment, Food and Rural Affairs Committee. (2022). *Labour shortages in*.
- Investopedia. (2022, July 26). *Top Agricultural Producing Countries*. Opgehaald van Investopedia: <https://www.investopedia.com/financial-edge/0712/top-agricultural-producing-countries.aspx>
- Jonkeren, O. (2021). *Brexit en de Nederlandse maritieme sector*. Den Haag: Ministerie van Infrastructuur en Waterstaat .
- Jukema, G., Ramaekers, P., & Berkhout, P. (2021). *De Nederlandse agrarische sector in internationaal verband – editie 2021*.
- Jukema, G., Ramaekers, P., & Berkhout, P. (2022). *De Nederlandse agrarische sector in internationaal verband verband - editie 2022*.
- Kantar. (2020). *End_Use of fruit berries and vegetables in Europe 2020*.
- Lankhuizen, M., & Thissen, M. (2019). The implications of re-exports for gravity equation estimation, NAFTA and Brexit. *Spatial Economic Analysis*, 384-403.
- LNV. (2021, April 9). *Meerderheid Nederlandse en Britse bedrijven ervaart last van Brexit*. Opgehaald van Agroberichten Buitenland: <https://www.agroberichtenbuitenland.nl/actueel/nieuws/2021/04/09/meerderheid-nederlandse-en-britse-bedrijven-ervaart-last-van-brexit>
- McKim, C. A. (2017). The Value of Mixed Methods Research: A Mixed Methods Study. *Journal of Mixed Methods Research* 2017, pp. 202-222.
- Mellens, M., Noordman, H., & Verbruggen, J. (2007). *Re-exports: international comparison and implications for performance indicators*.
- Melo Araujo, B. A. (2019). UK post-Brexit trade agreements and devolution. *Legal Studies (2019)*, 1-24.
- MerlinVenue. (2017, June 07). *What is it with the Brits and gardening?* Opgehaald van merlinvenues: <https://www.merlinvenues.com/what-is-it-with-the-brits-and-gardening/>
- Middelburg, A.-F. (2020, December 27). <https://www.hortipoint.nl/deboomkwekerij/geen-britse-importheffing-op-eu-bloemen/>. Opgehaald van Hortipoint: <https://www.hortipoint.nl/deboomkwekerij/geen-britse-importheffing-op-eu-bloemen/>

- Mielken, A. (2021, March 16). *Freeports: Benefit or burden?* Opgeroepen op July 8, 2022, van <https://www.foodmanufacture.co.uk/Article/2021/03/16/Freeports-Benefit-or-burden#>
- National Farmers Union. (2022). *British Farming A Blueprint for the future.*
- NOS nieuws. (2021, March 26). *Recordjaar voor tuinbranche, consumenten massaal de tuin in tijdens corona.* Opgehaald van Nos: <https://nos.nl/artikel/2374169-recordjaar-voor-tuinbranche-consumenten-massaal-de-tuin-in-tijdens-corona>
- Patty, L. (2022, July 12). Interview Brexit-Dutch agriculture Verdi Import. (J. v. Wijdeven, Interviewer)
- Port of Rotterdam. (2021). *Port of Rotterdam The Fastest Route to Freshness.*
- Port of Rotterdam. (2022). *Agribulk.* Opgeroepen op July 11, 2022, van Port of Rotterdam: <https://www.portofrotterdam.com/nl/logistiek/lading/droge-bulk/agribulk>
- Port of Rotterdam. (n.b.). *Deepsea en feeder.* Opgeroepen op July 14, 2022, van Port of Rotterdam: <https://www.portofrotterdam.com/nl/logistiek/verbindingen/deepsea-en-feeder>
- Ramaekers, P. (2022, May 13). Data collection. (J. van de Wijdeven, Interviewer)
- Redacteur, W. (2019, May 2). *HAVENBEDRIJF START ROTTERDAM FOOD HUB IN DE EUROPOORT.* Opgeroepen op January 31, 2022, van europoortkringen: <https://www.europoortkringen.nl/havenbedrijf-start-rotterdam-food-hub-in-de-europoort/>
- Reuters. (2016, October 20). *Plunging pound and threats put EU farm workers off the UK.* Opgehaald van Reuters: <https://www.reuters.com/article/britain-eu-migrant-workers-idUSL8N1CH3F7>
- Riumallo Herl, C. J. (2021, n.d. n.d.). Difference-in-differences. Rotterdam.
- Roos, J. (2006). *Internationale handelsstromen.*
- Schuylenburg, M. v. (2022, July 6). Interview Brexit-Dutch agriculture Port of Rotterdam. (J. v. Wijdeven, Interviewer)
- Smith, D., Arriola, C., Carrico, C., & Tongeren, F. v. (2019). *The potential economic impact of Brexit on the Netherlands.*
- Sol, D. (2022, June 23). Interview Brexit-Dutch agriculture GroentenFruit Huis. (J. v. Wijdeven, Interviewer)
- UK government. (2022, July 28). *Product export information for 0702.00.00.99 from Morocco to the United Kingdom.* Opgehaald van get-rules-tariffs-trade-with-uk: <https://www.get-rules-tariffs-trade-with-uk.service.gov.uk/country/ma/commodity/0702000099/70353>
- UK Government. (2022, July 27). *UK Integrated Online Tariff.* Opgehaald van GOV.UK: <https://www.trade-tariff.service.gov.uk/chapters/08>
- UK government. (2022, July 11). *UK trade agreements with non-EU countries.* Opgehaald van GOV.UK: <https://www.gov.uk/guidance/uk-trade-agreements-with-non-eu-countries>

- UK Government. (2022, July 20). *UK trade in numbers (web version)*. Opgehaald van gov.uk:
<https://www.gov.uk/government/statistics/uk-trade-in-numbers/uk-trade-in-numbers-web-version>
- van Kippersluis, H. v. (2018). Hypotheses.
- Van Oort et al. (2017). Exposure to Brexit in regions on both sides of the Channel. *VOXeu CEPR*.
- Van Oort et al. (2020). *The Implications of Brexit for UK and EU Regional Competitiveness*. Routledge.
- Vijverberg, V. (2022, July 25). Interview Brexit-Dutch agriculture Freight Line Europe. (J. v. Wijdeven, Interviewer)
- Waard, M. d. (2022, June 29). Interview Brexit-Dutch agriculture RedStar. (J. v. Wijdeven, Interviewer)
- Westerholt, R. (2022, June 24). Interview Brexit-Dutch agriculture P&O Ferries. (J. v. Wijdeven, Interviewer)
- Wong, K. F., & Lemmers, O. (2019). Distinguishing between imports for domestic use and for re-exports: a novel method illustrated for the netherlands. *National Institute Economic Review*, 59-67.
- WTO. (n.d., n.d. n.d.). *Evolution of trade under the WTO: handy statistics*. Opgehaald van WTO:
https://www.wto.org/english/res_e/statis_e/trade_evolution_e/evolution_trade_wto_e.htm

Appendix I List of Primary and Secondary agricultural product groups

	2020			2021 (raming)		
	Nederlandse makelij	Weder- uitvoer	Totaal	Nederlandse makelij	Weder- uitvoer	Totaal
Alle landbouwgoederen	68,4	27,3	95,7	75,7	29,0	104,7
<i>naar goederengroep (2 digits GN code)</i>						
GN-06 Sierteelt	8,5	1,0	9,6	10,5	1,5	12,0
GN-02 Vlees	7,5	1,0	8,5	8,1	1,0	9,1
GN-04 Zuivel en eieren	6,7	1,6	8,3	7,1	1,7	8,7
GN-07 Groenten	5,8	1,3	7,0	5,8	1,3	7,2
GN-08 Fruit	1,5	5,5	7,0	1,7	5,3	7,0
GN-22 Dranken	4,3	1,7	6,0	4,5	2,1	6,6
GN-15 Natuurlijke vetten en olien	2,8	1,9	4,7	4,0	1,7	5,7
GN-21 Overige voeding	3,4	1,6	5,0	3,8	1,7	5,5
GN-23 Resten van de voedselindustrie, veevoer	3,5	1,4	5,0	3,9	1,5	5,4
GN-19 Bereidingen van graan, meel en melk	4,5	0,8	5,3	4,1	0,9	5,0
GN-20 Bereidingen van groente en fruit	3,4	1,5	4,9	3,9	1,4	5,3
GN-X. Overige primaire en secundaire landbouw	3,1	1,0	4,1	4,1	1,4	5,5
GN-18 Cacao en -bereidingen	3,0	1,4	4,4	3,2	1,6	4,8
GN-12 Oliehoudende zaden en vruchten	1,9	1,9	3,8	2,1	2,0	4,0
GN-03 Vis en zeevruchten	2,2	0,8	3,0	2,4	0,9	3,3
GN-16 Bereidingen van vlees en vis	1,2	0,6	1,8	1,2	0,7	2,0
GN-01 Levende dieren	1,5	0,2	1,8	1,4	0,3	1,7
GN-17 Suiker en suikerwerk	1,1	0,4	1,5	1,3	0,3	1,7
GN-09 Koffie, thee, specerijen	0,6	0,6	1,2	0,7	0,6	1,3
GN-24 Tabak en tabaksproducten	0,7	0,3	1,0	0,6	0,3	0,9
GN-11 Meel, mout en zetmeel	0,7	0,1	0,8	0,8	0,1	0,9
GN-05 Andere producten dierlijke oorsprong	0,2	0,4	0,6	0,2	0,4	0,6
GN-10 Graan	0,2	0,4	0,6	0,2	0,3	0,5
GN-13 Plantensappen	0,1	0,0	0,1	0,1	0,0	0,1
GN-14 Vlechtstoffen (o.a. bamboe, riet)	0,0	0,0	0,0	0,0	0,0	0,0

+ overige primaire en secundaire landbouwgoederen. Dit zijn de goederensoorten die starten met de volgende cijfers: 29054500, 3301, 330210, 3501, 3502, 3503, 3504, 3505, 3823, 4001, 4101, 4102, 4103, 4105, 4106, 4301, 4302, 4401, 4402, 4403, 4406, 4407, 44081098, 44083930, 4409, 4501, 4502, 5001, 5002, 5003, 5101, 5102, 5103, 5104, 5105, 5201, 5203, 5301, 5302, 5303, 5304 en 5305.

Appendix II Dutch agricultural export values to all countries

Tabel B4.5 Export van landbouwgoederen naar bestemming (mrd. euro)

	2020			2021 (raming)		
	Nederlandse marktlijf	Weder- uitvoer	totaal	Nederlandse marktlijf	Weder- uitvoer	Totaal
Totaal landen	68,4	27,3	95,7	75,7	29,0	104,7
EU-27	42,1	22,0	64,1	48,1	24,1	72,3
Niet EU	26,3	5,3	31,6	27,6	4,8	32,4
Duitsland	15,9	8,6	24,5	17,3	9,0	26,3
België	6,9	3,8	10,7	8,0	4,1	12,1
Frankrijk	4,9	2,6	7,6	5,7	2,9	8,6
Verenigd Koninkrijk	6,1	2,4	8,5	7,0	1,6	8,6
Overig niet-EU	4,9	0,6	5,5	4,6	0,7	5,4
Italië	2,6	0,7	3,3	3,0	0,9	3,9
China	3,6	0,2	3,8	3,6	0,3	3,9
Spanje	1,9	0,9	2,7	2,2	1,1	3,3
Polen	1,7	1,0	2,7	2,1	1,1	3,3
VS	2,5	0,3	2,7	2,7	0,3	3,0
Denemarken	1,3	0,6	1,9	1,6	0,7	2,3
Zweden	1,3	0,6	2,0	1,5	0,7	2,2
Overig EU	0,9	0,5	1,4	1,3	0,7	1,9
Ierland	0,8	0,3	1,1	1,0	0,4	1,4
Zwitserland	1,0	0,3	1,2	1,0	0,3	1,3
Oostenrijk	0,7	0,5	1,2	0,8	0,5	1,3
Finland	0,5	0,5	1,0	0,5	0,6	1,1
Noorwegen	0,8	0,3	1,1	0,8	0,3	1,1
Tsjechië	0,6	0,3	1,0	0,7	0,3	1,1
Rusland	0,9	0,2	1,0	0,8	0,2	1,0
Griekenland	0,6	0,2	0,8	0,6	0,2	0,8
Japan	0,7	0,1	0,8	0,7	0,1	0,8
Roemenië	0,4	0,2	0,6	0,4	0,3	0,7
Zuid-Korea	0,4	0,0	0,5	0,6	0,0	0,6
Portugal	0,3	0,2	0,5	0,4	0,2	0,6
Hongarije	0,3	0,2	0,5	0,4	0,2	0,6
Turkije	0,4	0,1	0,6	0,4	0,1	0,6
Saoedi-Arabië	0,5	0,1	0,5	0,5	0,1	0,6

	2020			2021 (raming)		
	Nederlandse marktlijf	Weder- uitvoer	totaal	Nederlandse marktlijf	Weder- uitvoer	Totaal
Australië	0,5	0,1	0,6	0,5	0,1	0,6
Verenigde Arabische Emiraten	0,4	0,1	0,5	0,5	0,1	0,5
Canada	0,3	0,0	0,3	0,4	0,0	0,4
Mexico	0,3	0,0	0,3	0,4	0,0	0,4
Oekraïne	0,3	0,1	0,3	0,3	0,1	0,4
Slowakije	0,2	0,1	0,3	0,2	0,1	0,4
Zuid-Afrika	0,2	0,0	0,3	0,3	0,0	0,3
Israël	0,3	0,0	0,3	0,3	0,0	0,3
Taiwan	0,2	0,0	0,2	0,3	0,0	0,3
Kroatië	0,2	0,1	0,2	0,2	0,1	0,3
Marokko	0,3	0,0	0,3	0,3	0,0	0,3
Brazilië	0,2	0,0	0,3	0,2	0,0	0,3
Maleisië	0,2	0,0	0,2	0,2	0,0	0,2
Indonesië	0,2	0,0	0,2	0,2	0,0	0,2
Vietnam	0,2	0,0	0,2	0,2	0,0	0,2
Thailand	0,1	0,0	0,2	0,1	0,0	0,2
Chili	0,1	0,0	0,1	0,2	0,0	0,2
Nieuw-Zeeland	0,1	0,0	0,1	0,1	0,0	0,1
Ivoorkust	0,1	0,0	0,1	0,1	0,0	0,1
India	0,1	0,0	0,1	0,1	0,0	0,1
Colombia	0,1	0,0	0,1	0,1	0,0	0,1
Senegal	0,1	0,0	0,1	0,1	0,0	0,1
Peru	0,1	0,0	0,1	0,1	0,0	0,1
Costa Rica	0,0	0,0	0,0	0,0	0,0	0,0
Argentinië	0,0	0,0	0,0	0,0	0,0	0,0
Oeganda	0,0	0,0	0,0	0,0	0,0	0,0
Ecuador	0,0	0,0	0,0	0,0	0,0	0,0
Kenia	0,0	0,0	0,0	0,0	0,0	0,0
Tunesië	0,0	0,0	0,0	0,0	0,0	0,0
Angola	0,0	0,0	0,0	0,0	0,0	0,0
Ethiopië	0,0	0,0	0,0	0,0	0,0	0,0

Appendix III Excel output lay-out Eurostat Easy Comext

SLICE

Format Labels ▼

COLUMNS

Dimension #1 PRODUCT ▼

Format #1 Codes ▼

Dimension #2 None ▼

Format #2 None ▼

Dimension #3 None ▼

Format #3 None ▼

Dimension #4 None ▼

Format #4 None ▼

Dimension #5 None ▼

Format #5 None ▼

Number of columns to display

↕

ROWS

Dimension #1 REPORTER ▼

Format #1 Labels ▼

Dimension #2 PARTNER ▼

Format #2 Labels ▼

Dimension #3 PERIOD ▼

Format #3 Labels ▼

Dimension #4 None ▼

Format #4 None ▼

Dimension #5 None ▼

Format #5 None ▼

Number of rows to display

REPORTER	PARTNER	PERIOD/PRODUCT	A1	A2	A3	A4	A5	A6	A7	A8	A9
a1	b1	c1									
		c2									
		c3									
	b4	c1									
		c2									
		c3									
	b7	c1									
		c2									
		c3									

Eliminate zeroes

1. Dimension Selection
2. Layout Selection
3. Output Selection
Finish

Extracted on	2022-05-18 09:18:45									
FLOW	EXPORT									
INDICATORS	VALUE_IN_EUROS									
Back to TOC										
REPORTER	PARTNER	PERIOD/PRODUCT	01	02	03	04	05	06	07	08
Netherlands	United Kingdom	Jan.-Dec. 2021	44539342	1086316361	58064456	236979514	26636087	1642841632	823491352	301400650
Netherlands	United Kingdom	Jan.-Dec. 2020	39816748	1093333345	162932848	280344097	13451851	1184124045	856267470	485137311
Netherlands	Austria	Jan.-Dec. 2021	6203320	90156280	34172985	75857429	8164977	270220437	62822084	218823836
Netherlands	Austria	Jan.-Dec. 2020	7517322	82333631	31396907	64881804	9123337	208372851	61752452	219057021
Netherlands	Belgium	Jan.-Dec. 2021	298323293	680969269	572892202	1202365583	48492822	659623837	830909737	755813769
Netherlands	Belgium	Jan.-Dec. 2020	277343272	596484204	490784396	1118048325	36134068	529380326	760560884	695010121
Netherlands	Bulgaria	Jan.-Dec. 2021	3257392	37602557	5812223	28183715	425236	19724340	9703689	23690746
Netherlands	Bulgaria	Jan.-Dec. 2020	3766745	32306266	3165840	20666945	513547	15913905	8849919	12295572
Netherlands	Cyprus	Jan.-Dec. 2021	488252	34014515	9078001	17713449	454912	8537800	10255439	8344402
Netherlands	Cyprus	Jan.-Dec. 2020	538470	20078933	6035057	5017872	407379	7020273	9540849	7245505
Netherlands	Czechia	Jan.-Dec. 2021	4870409	95710552	20431173	41139703	3410053	197561654	97016781	169075682
Netherlands	Czechia	Jan.-Dec. 2020	3528192	92964679	13575231	32761608	6542381	163755957	91842426	156513426
Netherlands	Germany	Jan.-Dec. 2021	541218164	1916805083	645436390	2746846018	144945956	3333066279	2532669699	2986619941
Netherlands	Germany	Jan.-Dec. 2020	742180694	1836742658	568042054	2532068060	120060373	2756580743	2448098810	2974261587
Netherlands	Denmark	Jan.-Dec. 2021	22030784	376976238	102378509	109799822	10365310	308380207	181437296	232554799
Netherlands	Denmark	Jan.-Dec. 2020	12704671	309286982	89468685	96205859	8399947	267707268	158905779	226940217

Appendix IV STATA Regression output example

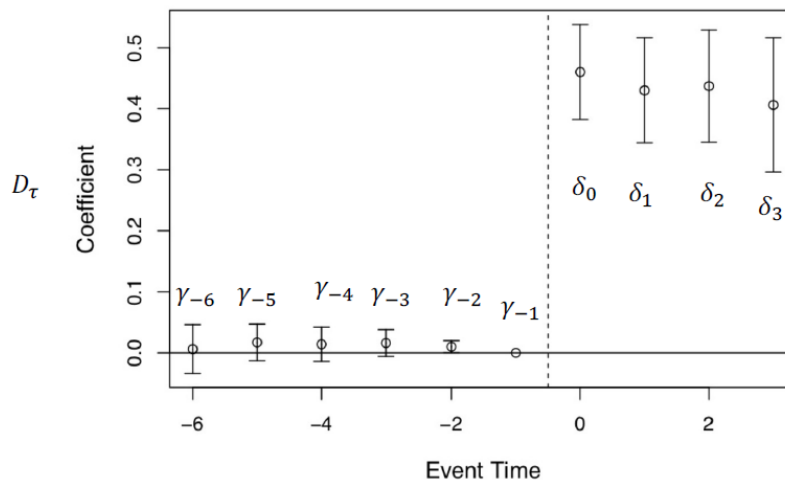
```

Random-effects GLS regression           Number of obs   =       308
Group variable: id                     Number of groups =        28
R-squared:                               Obs per group:
    Within = 0.1199                      min =          11
    Between = 0.0278                     avg =         11.0
    Overall = 0.1155                     max =          11
                                           Wald chi2(21)   =       37.36
corr(u_i, X) = 0 (assumed)              Prob > chi2     =       0.0153

```

Growth	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
1.Treated	-.0066591	.2151886	-0.03	0.975	-.428421	.4151029
Year						
2012	-.1199228	.0575116	-2.09	0.037	-.2326434	-.0072021
2013	-.0872811	.0575116	-1.52	0.129	-.2000017	.0254395
2014	-.0757922	.0575116	-1.32	0.188	-.1885129	.0369284
2015	-.0302492	.0575116	-0.53	0.599	-.1429698	.0824714
2016	-.081926	.0575116	-1.42	0.154	-.1946466	.0307946
2017	.0087118	.0575116	0.15	0.880	-.1040088	.1214325
2018	-.0810339	.0575116	-1.41	0.159	-.1937545	.0316868
2019	-.0888243	.0575116	-1.54	0.122	-.2015449	.0238963
2020	-.0878049	.0575116	-1.53	0.127	-.2005255	.0249158
2021	.1567075	.0575116	2.72	0.006	.0439869	.2694281
Treated#Year						
1 2012	.0424722	.3043227	0.14	0.889	-.5539893	.6389336
1 2013	.0617508	.3043227	0.20	0.839	-.5347106	.6582123
1 2014	-.0164902	.3043227	-0.05	0.957	-.6129517	.5799712
1 2015	-.0380838	.3043227	-0.13	0.900	-.6345453	.5583776
1 2016	-.0109237	.3043227	-0.04	0.971	-.6073851	.5855377
1 2017	-.090201	.3043227	-0.30	0.767	-.6866624	.5062605
1 2018	-.0346797	.3043227	-0.11	0.909	-.6311411	.5617817
1 2019	-.0042897	.3043227	-0.01	0.989	-.6007511	.5921717
1 2020	-.0391447	.3043227	-0.13	0.898	-.6356061	.5573168
1 2021	-.2611851	.3043227	-0.86	0.391	-.8576465	.3352764
cons	.1111367	.0406668	2.73	0.006	.0314312	.1908422

sigma_u | 0
sigma_e | .21582156
rho | 0 (fraction of variance due to u_i)



Appendix V Stata Total trade flow

```
1  ** Read Excel data file
2  import excel "C:\Users\jwjj\Documents\Master Urban Port Transport
3  Economics\THESIS\DATA\NEW Stata Read file Total flows.xlsx", sheet("Blad1") firstrow
4
5  twoway (line Total Year) if Exportdestination == "United Kingdom"
6
7  **Creating dummies for treatment group and post-intervention period
8  gen Treated = 0
9  replace Treated = 1 if Exportdestination == "United Kingdom"
10 label var Treated "Treatment Group"
11
12 gen Post = 0
13 replace Post = 1 if Year >= 2016
14 label var Post "Post Intervention Period"
15
16 *ID variable
17 egen id = group(Exportdestination)
18 *Interaction variable
19 gen PostXTreated = Treated * Post
20 *Set on panel data
21 xtset id Year, yearly
22
23 *checking top export destinations
24 gsort Year -Totalflow
25 list Year Exportdestination Totalflow if Year == 2011
26 list Year Exportdestination Totalflow if Year == 2012
27 list Year Exportdestination Totalflow if Year == 2013
28 list Year Exportdestination Totalflow if Year == 2014
29 list Year Exportdestination Totalflow if Year == 2015
30 list Year Exportdestination Totalflow if Year == 2016
31 list Year Exportdestination Totalflow if Year == 2017
32 list Year Exportdestination Totalflow if Year == 2018
33 list Year Exportdestination Totalflow if Year == 2019
34 list Year Exportdestination Totalflow if Year == 2020
35 list Year Exportdestination Totalflow if Year == 2021
36
37 gsort Exportdestination Year
38
```

```
39 **Option 1;;; top 10
40 keep if Exportdestination == "United Kingdom" | Exportdestination == "Germany" |
   ↳ Exportdestination == "Belgium" | Exportdestination == "France" | Exportdestination ==
   ↳ "Italy" | Exportdestination == "Spain" | Exportdestination == "Poland" | Exportdestination
   ↳ == "Denmark" | Exportdestination == "Sweden"
41
42 **Format settings and drop 2010 out of the data set
43 format %6.2g Growth
44 drop if Year == 2010
45
46 *Drop 2021 for other picture
47 drop if Year == 2021
48
49 ** trendlines with intervention in 2016
50 twoway (scatter Growth Year if Treated==0, msymbol(T) mcolor(black)) (scatter Growth
   ↳ Year if Treated==1, msymbol(O) mcolor(green)) (lfit Growth Year if Treated==0 & Year <
   ↳ 2016, lcolor(black)) (lfit Growth Year if Treated==0 & Year>=2015, lcolor(black)) (lfit
   ↳ Growth Year if Treated==1 & Year < 2016, lcolor(green)) (lfit Growth Year if Treated==1
   ↳ & Year>=2015, lcolor(green)), legend(label(1 "Fitted Control")label(2 "Fitted Treated")
   ↳ label(3 "Pre-Trend Control")label(4 "Post-Trend Control")label(5 "Pre-Trend Treated")
   ↳ label(6 "Post-Trend Treated"))
51
52
53 ** trendlines with intervention in 2021
54 twoway (scatter Growth Year if Treated==0, msymbol(T) mcolor(black)) (scatter Growth
   ↳ Year if Treated==1, msymbol(O) mcolor(green)) (lfit Growth Year if Treated==0 & Year <
   ↳ 2021, lcolor(black)) (lfit Growth Year if Treated==0 & Year>=2020, lcolor(black)) (lfit
   ↳ Growth Year if Treated==1 & Year < 2021, lcolor(green)) (lfit Growth Year if Treated==1
   ↳ & Year>=2020, lcolor(green)), legend(label(1 "Fitted Control")label(2 "Fitted Treated")
   ↳ label(3 "Pre-Trend Control")label(4 "Post-Trend Control")label(5 "Pre-Trend Treated")
   ↳ label(6 "Post-Trend Treated"))
55
56
57 ** Annual growth of total flow to diminish variances between observations in control
   ↳ group
58 xtreg Growth i.Treated##i.Year
59 coefplot, vertical keep(*.Treated*Year) yline(0)
```

Appendix VI Stata Re-export Dutch exports and Quasi-Transit

```

1  ** Read Excel Data File
2  import excel "C:\Users\jwij\Documents\Master Urban Port Transport
↳ Economics\THESIS\DATA\NEW Stata Read file Re-export&Dutch&Quasi.xlsx",
↳ sheet("Blad3") firstrow
3
4  *Trend lines UK different trade flows
5  twoway (line DutchExport Year) if Exportdestination == "United Kingdom"
6  twoway (line Reexport Year) if Exportdestination == "United Kingdom"
7  twoway (line QuasiTransit Year) if Exportdestination == "United Kingdom"
8
9  **Creating dummies for treatment group and post-intervention period
10 gen Treated = 0
11 replace Treated = 1 if Exportdestination == "United Kingdom"
12 label var Treated "Treatment Group"
13
14 gen Post = 0
15 replace Post = 1 if Year == 2021
16 label var Post "Post Intervention Period"
17
18 *ID Variable
19 egen id = group(Exportdestination)
20 *Interaction variable
21 gen PostXTreated = Treated * Post
22 *Set on Panel data
23 xtset id Year, yearly
24
25 *** Constructing the right control group
26 keep if Exportdestination == "United Kingdom" | Exportdestination ==
↳ "Germany" | Exportdestination == "Belgium" | Exportdestination ==
↳ "France" | Exportdestination == "Italy" | Exportdestination == "Spain" |
↳ Exportdestination == "Poland" | Exportdestination == "Sweden" |
↳ Exportdestination == "Denmark"
27
28 *Format setting and drop 2018 out of the data set
29 format %6.2g Growth_DutchExport
30 format %6.2g Growth_Reexport
31 format %6.2g Growth_Quasitransit
32 drop if Year == 2018
33
34 ** trendlines Dutch Export with intervention in 2021
35 twoway (scatter Growth_DutchExport Year if Treated==0, msymbol(T)
↳ mcolor(black)) (scatter Growth_DutchExport Year if Treated==1, msymbol(
↳ 0) mcolor(green)) (lfit Growth_DutchExport Year if Treated==0 & Year <
↳ 2021, lcolor(black)) (lfit Growth_DutchExport Year if Treated==0 & Year
↳ >=2020, lcolor(black)) (lfit Growth_DutchExport Year if Treated==1 &
↳ Year < 2021, lcolor(green)) (lfit Growth_DutchExport Year if Treated==1
↳ & Year>=2020, lcolor(green)), legend(label(1 "Fitted Control")label(2
↳ "Fitted Treated")label(3 "Pre-Trend Control")label(4 "Post-Trend
↳ Control")label(5 "Pre-Trend Treated") label(6 "Post-Trend Treated"))
36
37 ** trendlines Reexport with intervention in 2021
38 twoway (scatter Growth_Reexport Year if Treated==0, msymbol(T) mcolor(
↳ black)) (scatter Growth_Reexport Year if Treated==1, msymbol(0) mcolor(
↳ green)) (lfit Growth_Reexport Year if Treated==0 & Year < 2021, lcolor(
↳ black)) (lfit Growth_Reexport Year if Treated==0 & Year>=2020, lcolor(
↳ black)) (lfit Growth_Reexport Year if Treated==1 & Year < 2021, lcolor(
↳ green)) (lfit Growth_Reexport Year if Treated==1 & Year>=2020, lcolor(
↳ green)), legend(label(1 "Fitted Control")label(2 "Fitted Treated")label
↳ (3 "Pre-Trend Control")label(4 "Post-Trend Control")label(5 "Pre-Trend
↳ Treated") label(6 "Post-Trend Treated"))
39

```

```
40
41 ** trendlines Quasi Transit with intervention in 2021
42 twoway (scatter Growth_Quasitransit Year if Treated==0, msymbol(T) mcolor
↳ (black)) (scatter Growth_Quasitransit Year if Treated==1, msymbol(O)
↳ mcolor(green)) (lfit Growth_Quasitransit Year if Treated==0 & Year < 2021
↳ , lcolor(black)) (lfit Growth_Quasitransit Year if Treated==0 & Year>=
↳ 2020, lcolor(black)) (lfit Growth_Quasitransit Year if Treated==1 & Year
↳ < 2021, lcolor(green)) (lfit Growth_Quasitransit Year if Treated==1 &
↳ Year>=2020, lcolor(green)), legend(label(1 "Fitted Control")label(2
↳ "Fitted Treated")label(3 "Pre-Trend Control")label(4 "Post-Trend Control"
↳ )label(5 "Pre-Trend Treated") label(6 "Post-Trend Treated"))
43
44 ** Annual growth of Dutch Export to diminish variances between
↳ observations in control group
45 xtreg Growth_DutchExport i.Treated##i.Year
46 coefplot, vertical keep(*.Treated*Year) yline(0)
47
48 ** Annual growth of Reexport to diminish variances between observations
↳ in control group
49 xtreg Growth_Reexport i.Treated##i.Year
50 coefplot, vertical keep(*.Treated*Year) yline(0)
51
52
53 ** Annual growth of QuasiTransit to diminish variances between
↳ observations in control group
54 xtreg Growth_Quasitransit i.Treated##i.Year
55 coefplot, vertical keep(*.Treated*Year) yline(0)
```


Appendix VII Stata Greenport WestHolland

```
1 *Read Excel Data file
2 import excel "C:\Users\jw\Documents\Master Urban Port
↳ Transort Economics\THESIS\DATA\Zuid-Holland\Toespitsen op
↳ ZuidHolland.xlsx", sheet("ZuidHolland") cellrange(A1:J325)
↳ firstrow
3
4 **Creating dummies for treatment group and post-intervention
↳ period
5 gen Treated = 0
6 replace Treated = 1 if Exportdestination == "United Kingdom"
7 label var Treated "Treatment Group"
8
9 gen Post = 0
10 replace Post = 1 if Year >= 2016
11 label var Post "Post Intervention Period"
12
13 *ID variable
14 egen id = group(Exportdestination)
15 *Interaction variable
16 gen PostXTreated = Treated * Post
17 *Set on panel data
18 xtset id Year, yearly
19
20 *** Constructing the right control group
21 keep if Exportdestination == "United Kingdom" |
↳ Exportdestination == "Germany" | Exportdestination == "Belgium" |
↳ Exportdestination == "Denmark" | Exportdestination == "France" |
↳ Exportdestination == "Italy" | Exportdestination == "Spain" |
↳ Exportdestination == "Poland" | Exportdestination == "Sweden"
22
23 *Trend lines exports per product group
24 twoway (line Floriculture Year) if Exportdestination ==
↳ "United Kingdom"
25 twoway (line Vegetables Year) if Exportdestination == "United
↳ Kingdom"
26 twoway (line Fruit Year) if Exportdestination == "United
↳ Kingdom"
27
```

```
28  **for total flow Growth, data from 2011 onwards
29  drop if Year == 2010
30
31  ** trendlines floriculture with intervention in 2021
32  twoway (scatter Growth06 Year if Treated==0, msymbol(T) mcolor(
↳ black)) (scatter Growth06 Year if Treated==1, msymbol(O) mcolor(
↳ green)) (lfit Growth06 Year if Treated==0 & Year < 2021, lcolor(
↳ black)) (lfit Growth06 Year if Treated==0 & Year>=2020, lcolor(
↳ black)) (lfit Growth06 Year if Treated==1 & Year < 2021, lcolor(
↳ green)) (lfit Growth06 Year if Treated==1 & Year>=2020, lcolor(
↳ green)), legend(label(1 "Fitted Control")label(2 "Fitted Treated"
↳ )label(3 "Pre-Trend Control")label(4 "Post-Trend Control")label(5
↳ "Pre-Trend Treated") label(6 "Post-Trend Treated"))
33
34  ** trendlines Vegetables with intervention in 2021
35  twoway (scatter Growth07 Year if Treated==0, msymbol(T) mcolor(
↳ black)) (scatter Growth07 Year if Treated==1, msymbol(O) mcolor(
↳ green)) (lfit Growth07 Year if Treated==0 & Year < 2021, lcolor(
↳ black)) (lfit Growth07 Year if Treated==0 & Year>=2020, lcolor(
↳ black)) (lfit Growth07 Year if Treated==1 & Year < 2021, lcolor(
↳ green)) (lfit Growth07 Year if Treated==1 & Year>=2020, lcolor(
↳ green)), legend(label(1 "Fitted Control")label(2 "Fitted Treated"
↳ )label(3 "Pre-Trend Control")label(4 "Post-Trend Control")label(5
↳ "Pre-Trend Treated") label(6 "Post-Trend Treated"))
36
37
38  ** trendlines Fruit with intervention in 2021
39  twoway (scatter Growth08 Year if Treated==0, msymbol(T) mcolor(
↳ black)) (scatter Growth08 Year if Treated==1, msymbol(O) mcolor(
↳ green)) (lfit Growth08 Year if Treated==0 & Year < 2021, lcolor(
↳ black)) (lfit Growth08 Year if Treated==0 & Year>=2020, lcolor(
↳ black)) (lfit Growth08 Year if Treated==1 & Year < 2021, lcolor(
↳ green)) (lfit Growth08 Year if Treated==1 & Year>=2020, lcolor(
↳ green)), legend(label(1 "Fitted Control")label(2 "Fitted Treated"
↳ )label(3 "Pre-Trend Control")label(4 "Post-Trend Control")label(5
↳ "Pre-Trend Treated") label(6 "Post-Trend Treated"))
40
41  ** Annual growth of Sierteelt to diminish variances between
↳ observations in control group
42  xtreg Growth06 i.Treated##i.Year
43  coefplot, vertical keep(*.Treated*Year) yline(0)
44
45  ** Annual growth of Groenten to diminish variances between
↳ observations in control group
46  xtreg Growth07 i.Treated##i.Year
47  coefplot, vertical keep(*.Treated*Year) yline(0)
48
49  ** Annual growth of Fruit to diminish variances between
↳ observations in control group
50  xtreg Growth08 i.Treated##i.Year
51  coefplot, vertical keep(*.Treated*Year) yline(0)
52
```

Appendix VIII Gains and losses in exports to UK in million euro's

PRODUCT	YEAR	BE+-	DE+-	DK+-	ES+-	FR+-	IT+-	NL+-	PL+-	SE+-
01 Levende dieren	2021	4,6	8,0	-6,3	-1,6	19,8	-1,3	4,7	0,4	-0,5
02 Vlees	2021	21,1	-62,5	-69,8	-14,1	2,3	2,4	-7,0	-17,7	-1,4
03 Vis en Zeevruchten	2021	13,7	-26,8	-98,7	-13,1	-11,0	-5,5	-104,9	-8,3	-303,3
04 Zuivel en eieren	2021	111,1	-132,6	-19,2	-2,2	-41,8	-11,8	-43,4	1,4	-0,3
05 Andere producten dierlijke oorsprong	2021	-1,4	-3,1	-0,3	1,1	-4,3	0,2	13,2	3,8	0,0
06 Sierteelt	2021	-28,4	-34,0	-5,7	-4,0	0,1	17,8	458,7	-2,3	0,0
07 Groenten	2021	-39,1	-26,7	-1,4	108,7	-34,3	3,8	-32,8	11,9	-1,1
08 Fruit	2021	-60,4	-58,1	-0,1	-27,1	9,7	16,5	-183,7	10,5	-2,5
09 Koffie, Thee en specerijen	2021	23,7	5,2	-0,7	1,4	-143,0	-2,4	-15,1	-6,5	0,0
10 Graan	2021	-8,9	-82,8	-23,6	-0,9	24,3	-3,4	-14,0	44,1	-15,8
11 Meel, mout, zetmeel	2021	-3,2	-11,1	-2,4	5,7	-13,3	-1,8	15,4	-1,2	-2,6
12 Oliehoudende zaden en vruchten	2021	-23,8	-7,0	-1,3	-14,1	-4,8	3,6	-62,1	0,9	-0,2
13 Plantensappen	2021	-1,4	-7,3	-0,9	2,4	-1,4	2,4	-1,2	-0,7	-0,1
14 Vlechtstoffen (o.a. bamboe, riet)	2021	-0,1	-0,1	0,0	-0,1	-1,3	-0,1	1,7	0,0	0,0
15 Natuurlijke vetten en oliën	2021	46,4	-17,8	4,5	-24,1	0,1	-5,9	12,2	3,0	2,6
16 Bereidingen van vlees en vis	2021	156,8	-168,8	-56,2	-13,0	-30,1	-0,3	-13,1	19,9	9,8
17 Suiker en suikerwerk	2021	46,6	6,5	0,8	10,3	-15,2	6,6	-0,7	5,2	-1,7
18 Cacao en bereidingen	2021	-9,8	-41,1	0,0	-10,0	-12,5	21,9	-49,7	-13,6	-2,2
19 Bereidingen van graan, meel, melk	2021	191,8	-105,8	4,2	1,9	46,7	2,8	-5,3	-9,0	-1,9
20 Bereidingen van groente en fruit	2021	10,9	-78,0	-7,3	15,4	-74,7	-58,6	-18,0	-9,9	0,4
21 Overige voeding	2021	109,1	-60,6	4,1	1,6	-24,4	-5,5	-11,6	-1,9	-2,9
22 Dranken	2021	209,0	-18,9	4,7	-4,8	274,6	74,8	131,2	-4,1	47,6
23 Resten voedselindustrie, veevoer	2021	12,6	-16,4	-15,7	-12,4	22,4	0,3	34,1	9,9	-2,9
24 Tabak en tabaksproducten	2021	-7,7	1,3	-1,5	-0,3	0,1	-0,2	-67,5	-149,3	-1,2
X Secondary product groups		2,4	126,6	-51,6	7,5	0,0	25,6	-11,4	50,3	525,9
Total growth 2021 in million€		775,7	-812,0	-344,7	14,2	-12,0	81,9	29,7	-63,3	245,8
Total exports in billion€		4,2	4,5	1,2	4,4	5,6	3,8	8,7	3,1	1,5

BE	Belgium
DE	Germany
DK	Denmark
ES	Spain
FR	France
IT	Italy
NL	Netherlands
PL	Poland
SE	Sweden